JPRS-UMA-85-053

9 September 1985

# USSR Report

## MILITARY AFFAIRS

## AVIATION AND COSMONAUTICS

No 6, June 1985



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Except where indicated otherwise in the table of contents the following is a complete translation of the Russian-language monthly journal AVIATSIYA I KOSMONAVTIKA published in Moscow.

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IMPORTANCE OF TRAINING COMPETENT AIR TRAFFIC CONTROL PERSONNEL

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 1-3

[Article by Honored Military Pilot USSR Mar Avn P. Kirsanov, chief, USSR Armed Forces Central Flight Safety Inspectorate: "Reliability of Control and Flight Safety"]

[Text] The training and indoctrination process is proceeding in the Air Forces with a high degree of intensity. Aircrews, flights, squadrons, and aviation units as a whole are working persistently to accomplish combat training tasks, boosting their tactical air proficiency. They are in a continuous state of readiness to respond immediately to repel aggression from any quarter.

A combined approach to coordinated achievement of combat training and flight safety goals has become widespread in the Air Forces. This enables vanguard aviation collectives to conduct intensive flying activities in an orderly manner. Successful accomplishment of complex, important combat training tasks is closely linked with efforts to prevent air mishaps and near-mishap situations and with strict observance of flight rules and regulations as well as conscientiously precise performance of job-related duties on the ground and in the air by each and every specialist. Attainment of targeted air proficiency performance levels, mastery of advanced maneuvers and combat procedures, boosting of proficiency rating and, in the final analysis, a high level of combat readiness are the result of this difficult labor.

Such activities deserve all possible encouragement. There still are some commanders, staff officers and political officers, however, who ignore certain flight safety requirements and display a lip-service attitude toward flight safety regulations, justifying their neglect by claiming concern with intensity of flight operations. In such subunits flight operations are sometimes attended by dangerous accident-threatening situations and serious violations of regulations. These mistakes break the rhythm of flight operations and negatively affect end results in combat training and achievement of adopted pledges.

Conscientious observance of the requirements of flight safety in the process of daily military training is one of the main conditions for each and every

pilot (aircrew), subunit, and unit to attain the targeted combat readiness indices.

Knowledgeable, reliable management and control of flight operations is a most important component of practical securement of flight safety. Statistics and analysis of deviations from the requirements of guideline documents attest to the fact that more than half of all serious accidents occur when aircrews are in a zone where they are being controlled or monitored by an air traffic control facility -- an airfield tower, range control officer, or aviation unit command post. The degree of monitoring and control of aircrews which have gotten into dangerous situations varies -- from continuous automated tracking with continuous display of flight data to sporadic visual observation or monitoring a radio communications frequency. As a rule, however, there is always a possibility of influencing the development of events.

It would unquestionably be wrong to blame each such incident solely on those personnel controlling and monitoring a given aircrew. As practical experience indicates, dangerous situations generally arise and develop with the concurrence of several causative factors, determined by the pilot, by the flight operations officer, by the operating condition of the equipment, as well as by other objective and subjective factors.

It is therefore much more correct and advisable to select a different approach to appraisal of a mishap-threatening situation which has taken place in a control zone, where one not only determines the cause but also determines whether the flight operations officer, for example, or the tactical control officer could have prevented a dangerous situation from occurring and particularly from developing, regardless of who was to blame and why it occurred. It is advisable thereby to construct accident prevention along three basic lines: to provide for the elimination of ignorant actions by an air traffic controller which can lead to the occurrence of an air-mishap situation; to ensure precise monitoring, by available means of information (radar, radio, visual, etc), of the actions of aircrews, which will make it possible promptly to spot and prevent errors and violations of procedures; to be in a state of readiness to assist an aircrew in a knowledgeable and prompt manner.

The first of these areas is predominant in flight operations control practice. Analysis indicates that an air traffic controller frequently makes the air environment in his zone of responsibility more complicated due to incorrect distribution of altitudes, zones, and routings, which leads to aircraft coming dangerously close together in the air and the issuing of commands which tend to get an aircraft into a stall situation or an altitude below minimum safe altitude. Deterioration of weather is not always considered. Unfortunately instances of this kind, in spite of the fact that they are both typical and obvious, sometimes are repeated literally within the course of the same period of training in aviation units which are under common command and control. It sometimes happens that some commanders view such preconditions for air mishaps not as mistakes in organization and control of flight operations but as errors in pilot flying technique, although they had gotten into a difficult situation precisely due to ignorant commands received from the ground.

Recently, in the aviation unit in which officer G. Dyadechko monitors observance of flight safety procedures, a bomber being flown by pilot S. Giatsintov was damaged during an extremely hard landing. Pilot error was adjudged to be the cause. An investigation conducted by an inspector from central headquarters indicated that the tower controller had cleared Giatsintov to land during a snow squall, onto a snow-covered runway, with virtually zero visibility at the runway threshold. It is noteworthy that a similar incident had occurred somewhat earlier in a neighboring regiment, involving Lt Col V. Lobov. Following a hard landing, this pilot was forced immediately to execute emergency procedures and get out of his aircraft. In addition, 10 days prior to Giatsintov's landing, the unit had received materials on investigation of a near-mishap situation where a tower controller had cleared a combat trainer to land with fog on final approach. The document contained demands specified by the higher command authority and methods instructions on organizing measures to prevent such violations of procedures. As we see, however, no measures were taken to ensure flight safety, which led to undesirable consequences.

The second direction in efforts to prevent mishap-threatening situations consists in immediate intervention by members of the air traffic control team to correct pilot errors in planning and constructing maneuvers, in aircraft operation, as well as in instances of deviations by the established procedure of task execution (violation of discipline). With complacent, thoughtless execution of duties by air traffic control team members, these actions frequently have an unpleasant outcome. In those cases where personnel assigned to direct flight operations in the airfield area or on the range have failed to respond to a pilot's error, mishap-threatening situations or actual air mishaps have become inevitable.

Such a mistake was made, in particular, by unit aerial gunnery and tactical training chief Maj A. Smirnov, in charge of gunnery practice against a naval target. Failing to note a pilot's error in moving onto his attack course and failing to observe the attacking aircraft, he gave authorization to proceed. As a result some of the munitions impacted in the area in which the command launch, carrying the gunnery supervision team on board, was located. Due to Smirnov's carelessness he called fire on himself, so to speak.

Not only novice air traffic controllers but experienced specialists as well make mistakes as a consequence of insufficient monitoring. This happens as a rule if their attention is diverted away from performance of their immediate job duties to handle other matters not connected with air traffic control, as well as if they overestimate their ability to distribute their attention at the controller's work station.

We should particularly mention monitoring on the part of an air traffic controller to ensure strict adherence to the flight assignment by a pilot who happens to be the controller's service superior. Laxness, arbitrary procedures, and misplaced tactfulness sometimes contribute to the development of a mishap threatening situation. Flying commanders should show an example of conscientious execution of all elements of a flight assignment, for this is a graphic demonstration of unity of word and deed in practice!

The toughest situation for an air traffic control team is when an in-air emergency occurs. Of course the overwhelming majority of such emergencies are covered by prescribed procedures in corresponding documents, but the uniqueness of the conditions involved in occurrence and development of a dangerous situation (low airspeed, insufficient altitude, little fuel remaining, deteriorating weather), in combination with the pilot's individual qualities and the reserve capabilities of the aircraft, assume the probability both of a favorable and adverse outcome. And the outcome depends to a considerable degree on the skill and professionalism of the air traffic controller, his psychological stability, and even intuition grounded on experience.

There have been cases where a decision by an air traffic controller, acting in conformity with some specific provision in a guideline document but failing to consider other possibilities and methods of correcting a dangerous situation which has developed, has proven far from optimal. Once the crew of a bomber piloted by Lt Col V. Bondarev found itself in a difficult situation. The aircraft was making a flight to another field. One minute after takeoff the annunciator panel display lit up, warning of excessive oil consumption in the port engine. The operating manual stated that engine shutdown was not mandatory in this situation. In addition, Lieutenant Colonel Bondarev was an experienced pilot. All they had to do was reduce power and closely monitor the other engine parameters. Air traffic controller officer G. Kudryashov, without assessing the situation and without hesitation, ordered the engine shut down.

Continuing the flight on one engine, the crew did not take steps to land immediately, although the aircraft's gross weight was such that they could have landed immediately without burning off fuel, and there were no other aircraft above the airfield at the time. Descending, the pilot proceeded to set up a procedure turn for a landing approach. But he was unable to complete the approach, since at the moment he turned onto his final approach heading it began to snow, and visibility dropped considerably. This coincided with a brief failure of the radar system and localizer receiver. Again passing over the runway, the pilot proceeded to head outbound to set up another procedure turn. At this point the unexpected occurred: as they were proceeding outbound, the heavy aircraft, losing all power, began falling groundward. To the credit of Lieutenant Colonel Bondarev, at this point he responded vigorously and with precision, making the only correct decision.

Analysis of the performance of air traffic controllers of various degrees of proficiency indicates that they make mistakes of different types. These include delay in deciding to send an aircraft to an alternate airfield, lax monitoring of fuel consumption, lengthy interrogations of an aircrew in an emergency situation, and especially slowness about giving the order, when the situation demands it, to abandon the aircraft. In the latter instance a controller should always bear in mind that when a pilot gets into an emergency situation through his own fault, as a rule he will try at all costs to correct his error and may fail to act upon passing through minimum safe altitude, upon reaching which regulations require that the crew bail out or eject.

Consequently the air traffic controller must know a great deal and have a great deal of ability. The activities of those persons responsible for training officers assigned to air traffic control should be directed toward acquisition of this knowledge and these skills. On-the-spot inspections indicate that this work is not everywhere organized as it should be. While strict monitoring and assistance on the part of higher-echelon commanders and authorities is the case everywhere as regards categories of flight training, they rely more on the independent approach in training air traffic controllers. The main thing, they figure, is to issue an order, but beyond this point the individual will "mature" on his own.

Instruction and testing of officers' readiness to undertake air traffic control should be just as seriously thought through and organized as flight training. A competent advance from the simple to the complex is just as important here, interruptions in practical guidance have just as strong an effect, and excessive attention to form with consequent detriment to content in determining actual (rather than on-paper) preparedness is just as dangerous, if not more so. Persons in authority tasked with instructing subordinates in directing flight operations at airfields, command and control facilities bear considerable responsibility. This art cannot be taught by reprimand and dressing down. Duty shift after duty shift must be spent with a trainee in the control tower, patiently critiquing and analyzing his mistakes, which are inevitable in the initial period, providing an example of self-control and composure, which constitute a foundation for the operation of the entire air traffic control team in any situation.

Experience attests to the fact that novice air traffic controllers should train in special classrooms, on simulators. In many cases tape recordings of commands and actual radio communications in hazardous situations are extremely useful. They are accompanied by advice by highly-skilled specialists on the advisability of various actions in a specific situation. Officers of specific sections and the flight safety service should work on selection of such tapes.

Such classes and simulators would seem to have exhausted their capabilities for air traffic controllers with a fair amount of experience on the job. For this category of specialist personnel it is more advisable to check their preparedness to perform controller duties, with introduction of scenario instructions which have been planned and approved in advance, such as with utilization of a special transport aircraft crew. A critique and analysis of such a practice session is always highly instructive.

It is no secret that not every experienced pilot can successfully control air traffic. Therefore individual characteristics should be determined prior to making the decision to authorize a specific officer to serve as a controller. The same applies to regular air traffic control personnel selected from pilots and navigators no longer on flight duty. An optimal combination, alternation between flight personnel and regular controller personnel in the process of on-line training of flight operations controller personnel makes it possible to ensure a reasonable work-loading and at the same time to maintain the requisite controller skills on the part of both personnel categories.

I believe it would make sense to provide instruction for flight operations controller team personnel in formal courses of study or at military educational institutions, which would provide them with solid training for subsequent performance of air traffic controller duties.

There is usually no shortage of information on flight operations safety connected with command and control. The most typical cases for a given air component should be selected from available information and worked up in the form of diagrams or cards, taking into account the specific features of basing and missions being performed. Periodic repetition of such selections is highly advisable, especially when new personnel are assigned to flight operations controller teams.

Increasing reliability of control should continue in the future creating favorable conditions for intensive mishap-free flight operations, without which planned and orderly attainment of specified performance levels in training and increasing combat readiness is impossible. Selfless labor by all specialist personnel assigned to air traffic control will be a worthy contribution toward further strengthening the combat power of our valiant Air Forces.



3024
CSO: 9144/565

FIGHTER PILOTS SHOULD MASTER ADVANCED MANEUVERS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 4-5

[Article, published under the heading "Be Alert, In a Continuous State of Combat Readiness," by Military Pilot 1st Class Lt Col G. Drugoveyko, aviation squadron commander: "Flying Skills Are a Tool"]

[Text] Maj Yu. Priymak's group was to engage in air-to-air combat. The air situation was developing unfavorably! The "aggressor" had taken steps maximally to complicate receiving and evaluation of incoming information and to make difficult fighter detection and control by radio communications and radar links. The group's pilots had to rely on their own resources: to engage aggressively in search for the "enemy" with the aid of their airborne electronics and visually, and to prepare themselves mentally for air-to-air combat in the most unexpected initial conditions.

On that mission Maj Yu. Priymak was the first to spot an "aggressor" group, which was heading toward them at a somewhat higher altitude. Range between the swiftly-closing aircraft was about 5 kilometers at the moment of detection. The situation, quite frankly, could not have been worse. But the fighter pilot follows an immutable law: if you detect the enemy, destroy him. But how should this be done? In the case at hand it was necessary to consider at least two circumstances: what maneuver would ensure a successful attack, and how should they repulse an attack by possible covering aircraft?

Maj Yu. Priymak immediately put his aircraft into a climbing maneuver, which would bring him into the area of successful weapon employment, while his partner proceeded to scan the sky to spot any covering aircraft.

Soon the officer received a report that an escort cover group had been spotted. The situation required revision of a decision which had been made and was already being executed. Major Priymak flew his aircraft in such a manner as to reach weapon release range as quickly as possible, and after the attack he would immediately execute a maneuver to head straight for the "aggressor" covering group. The two-aircraft element successfully accomplished its mission -- the "aggressor" was attacked, and its protective cover was hit by the other pair.

Priymak's men accomplished a rather difficult mission in excellent fashion in the situation which had developed. Why had they been successful? Because the commander had made a correct decision? Yes. But it essentially had been the only possible decision. Was it perhaps the fact that the group maintained tactical teamwork in conditions of limited information? Without question. But this also did not guarantee the safety of Yu. Priymak's pair during the attack, since the "aggressor" could have opened fire before the other pair had moved into the attack.

I believe that the leader's excellent flying skill made it possible to gain victory in these conditions. It was precisely the ability to execute an optimal maneuver which guaranteed a successful attack and the aircraft's safety.

Here is another example. A group led by Maj A. Mashchenko was assigned the mission to carry out a mock air engagement. The tactical scenario called for designating a group to get the "enemy" to commit to combat. Who should be assigned to this group? This was no easy question. On the one hand its role was outwardly comparatively passive: to lure the "aggressor," and nothing more. Perhaps this mission should be assigned to some less experienced pilot, keeping the most proficient pilots in the attack group? On the other hand, however, the decoy group was deliberately exposing itself to attack, and this meant that ensuring its safety was the most important problem. In addition, precombat maneuvering should be executed with exceptional precision, in order to maintain the parameters of the overall formation and reliable tactical coordination.

Having analyzed many factors, the commanding officer assigned the decoy mission to Maj A. Tsurikov, one of the most proficient, skilled pilots. The course of combat confirmed the correctness of distribution of tactical missions. Tsurikov executed complex maneuvers with exceptional precision, decoyed the "adversary," drew him into position to be hit by the main force, while at that moment when the "adversary" was about to attack him, he evaded with a vigorous and complex maneuver. In addition, possessing a clear picture of the mutual positioning of aircraft in the air, he was able to take up a position which permitted him to provide cover for his own strike group and, if necessary, to build up its efforts.

Here is another incident. Capt V. Shcherbina's group was on a strike mission against ground targets. Since the situation on the "battlefield" was constantly changing, the pilots knew in advance only their approximate location. In addition, once airborne, the aircrews were informed that the "adversary" had beefed up air defense in the tactical area of operations. This made it necessary, on approaching the range, to employ vigorous maneuvering to evade antiaircraft weapons and to alter their direction of approach to the target.

As anticipated, the "adversary" was spotted at a location different from what had been expected. In this instance they of course could have executed secondary maneuvers and attacked on the briefed heading. But only seconds remained to the designated time, and therefore they had to act immediately.

And Captain Shcherbina's group executed a combined maneuver, consisting of several flight maneuvers transitioning one into the other. The ground targets were attacked successfully and, most important, on schedule. In addition, vigorous maneuvering with change in aircraft heading and plane of movement ensured that the aircrews evaded air defense assets.

As is evident from the examples, the pilots achieved success thanks to the ability to pilot their aircraft skillfully. As we know, if aircraft become more complex, with greater combat capabilities, fighter tactics also logically become more complex. But something else is also displayed in this mechanism -- with increasing complexity of tactics, there occurs a significant increase in complexity of maneuvering, which in turn imposes extremely stringent demands on the pilot's flying skill. Consequently, mastery of the art of flying technique is a fundamental professional quality of the fighter pilot.

Naturally expert flying technique begins with a pilot's ability correctly to execute all the classic maneuvers which are part of the arsenal of advanced flying technique. As a rule all fighter pilots possess mastery of these maneuvers. This level of aircraft mastery is prescribed by the appropriate documents and is continuously checked by commanders and staffs. And the requirement of pilot proficiency presumes regular training sorties to practice flying skills. There is a large difference, however, between the ability simply to execute advanced maneuvers correctly and mastery of the art of flying technique. Just what does expert flying skills mean?

First of all, in our opinion it is a pilot's ability to execute various configuration sequences of maneuvers. Take the loop, for example. What does execution of this maneuver boil down to? At the specified altitude and power settings, the pilot accelerates to the required airspeed, generates a g-load at the recommended rate and, maintaining it within specified limits, observing safe practices, he executes the loop. But modern fighters have considerably greater flying performance capabilities. One can enter the loop, for example, within a fairly broad range of airspeeds. And a highly-skilled pilot should be able to execute the maneuver entering at airspeeds from maximum allowable to minimum safe airspeed.

Yes, flying technique is becoming more complicated: the volume of information which a pilot analyzes in the process of executing a maneuver is expanding; the probability of errors occurring is increasing; one must know an aircraft's stability and control characteristics. Nevertheless every pilot must master the technique of executing a loop. In addition, it is advisable to incorporate into the maneuver trajectory segments of straight-line flight in its various phases. This is extremely essential in order to be able to aim and open fire from any spatial attitude. It is important to be able to execute a loop with the least possible g-load, which ensures a considerably greater altitude gain on the ascending part of the maneuver.

One can select as many variations of execution of traditional flight maneuvers as one likes. And if one approaches this in an innovative manner, with appropriate calculations and methods recommendations, the fighter pilot's tactical capabilities will increase many times over.

Secondly, expert flying skill includes the pilot's ability to utilize the entire range of aircraft performance characteristics, that is, to fly in near-critical conditions. All pilots know that the maximum performance climbing turn is an effective maneuver in air-to-air combat. It is frequently employed in the conduct of air engagements, but it is rarely included in advanced maneuvers practice routine, and when it is included, it is not executed at maximum performance. Precisely for this reason many pilots are unable to execute a maximum performance climbing turn with confidence, when it begins at a speed close to maximum and ends at close to minimum controllable airspeed, with maximum allowable g-load during the turn.

We should state that it is not easy to determine flaws in flying skills training. Let us say, for example, that during a combat engagement, following a maneuver, a pilot reached the attack initiation point at an excessive range. Additional time and maneuvering were required to close. This would seem to be a simple matter, no real problem. In actual combat, however, one can scarcely count on victory if the attack is not swift. To achieve this, the combat pilot should be able to execute any maximum-performance maneuver. Therefore they must be included in practice sessions when mastering flying skills. Only when a pilot flies his aircraft across the entire range of altitudes, speeds, g-loads, angles of attack, and angular speeds will he boldly engage, accurately aim and deliver fire.

Thirdly, expert flying technique is composed and deliberate flying. In other words the combat pilot should know precisely where his aircraft will be after executing a maneuver or part of a maneuver -- at what altitude and range, and at what heading from the beginning of the maneuver with various maneuver parameters. There also exists a reciprocal problem: what maneuver should he execute and in what manner in order to arrive at the desired point with the parameters essential for accomplishing a specific tactical objective? Instruction in theory and the ability to perform aerodynamic calculations, including with simplified methods and mentally, play a special role here. Knowledge of theory will become a combat arsenal if it is reinforced in practical flying.

Fourthly, the art of flying technique presupposes transition from one maneuver to another. And the preceding maneuver is many times uncompleted at the point of transition. Take, for example, change in direction in the course of a maneuver. A pilot should definitely know precisely the area of executability of maneuvers and rapidly analyze the aircraft's current energy and dynamic characteristics.

As practical experience in mock combat indicates, any maneuver "in pure form" is a very rare phenomenon. Even a chandelle and half roll become considerably "deformed" in the course of combat maneuvering: the plane of the maneuver changes, as does the g-load and frequently engine power settings. A pilot does not always even notice transitions from one maneuver to another by quantitative indices. Or more precisely, he does not focus attention on this, since the end result has greater importance for him.

This aspect of flying skills training is of particular importance in developing models of air-to-air combat, or attacks on ground targets, for an

expected change in maneuver forces the adversary to revise his decision, and in combat with time of the essence that is a rather complicated process. Therefore, the richer the inventory of mastered maneuver configurations, the greater the probability of achieving success in air-to-air combat or in striking ground targets.

Aircraft handling expertise has not been exhaustively treated here. This is merely an attempt to grasp the essence of the question. Every aviator, analyzing his own piloting experience, could add a great deal

There is no doubt that the initial, base level of aircraft handling proficiency is skilled execution of maneuvers following the traditional method: establishment of initial aircraft movement and engine operating parameters, creation of the requisite aircraft dynamics, and maintenance of the specified conditions up to exit from the maneuver. This is followed by transition to the next maneuver. Even during the initial process of mastering aircraft handling skills, however, it is essential to diversify the set of acrobatic maneuvers, their sequence, and altitude of entry. At this stage of training the most important thing is to achieve clean flying technique. It is then expedient to practice aircraft handling techniques according to various programs -- from simple to complex. Here the pilot should learn to execute maneuvers with various aircraft movement parameters in various maneuver planes.

One of the most difficult stages in the development of the fighter pilot as a skilled performer in advanced maneuvers is mastery of the entire range of an aircraft's performance characteristics. There are no fundamentally singular features in training here, but it is very important to possess a thorough understanding of the peculiarities of an aircraft's behavior on the edge of critical conditions and to be able instantly to bring the aircraft into the stable flight envelope. In addition, it is important to know precisely what aircraft flight parameter close to such conditions determines at a given moment the critical nature of flight and how to manipulate the controls in order to ensure that this parameter moves into a safe area.

Flying combination maneuvers does not present any particular difficulties, but it places rigid requirements on the pilot's spatial orientation and his ability to utilize instrument and visual information. Diversified practice drills and rehearsal of actions on the basis of scenario instructions are very helpful in this. There is an immutable law in education science: mere repetition, regardless of the number of times, does not produce improvement. Only a gradual but steady increase in complexity increases skill. This applies directly to fighter pilot training in flying technique. It is impossible to achieve proficiency without making tasks increasingly more complex.

We know from the experience of the last war that 80 percent of the total number of aircraft downed in combat were kills credited to 20 percent of the combat pilots. I believe that proficiency in aircraft handling, alongside other factors, lies behind these figures. We are dealing with quality, produced not only by particular natural ability but also by training in flying technique. Incidentally, the "specialization" of fighter pilots is noted in

many sources in the literature, including memoirs. There are pilots with particularly strong capabilities to spot the enemy, there are pilots distinguished by exceptionally accurate fire, etc.

It is entirely possible that it will be beyond the ability of some to achieve full mastery of flying skills. I do not believe that there is anything bad about this. On the contrary, the commanding officer will be able to assign each pilot a mission in conformity with the specific features of his individual proficiency.

Thus increasing complexity of equipment leads to increasing complexity of tactics. And this in turn engenders new, increasingly tough requirements on the fighter pilot's flight training proper, viewed as a tool for performing his job. Improvement of this tool is dialectically substantiated, even if it involves certain difficulties.



3024
CSO: 9144/565

FIGHTER FLIGHT COMMANDER TRAINS HIS MEN WELL

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) p 6

[Article by Lt Col A. Finayev: "In Keen Rivalry"]

[Text] In the course of a tactical air exercise the squadron's aviation personnel were assigned the mission to provide air support to ground subunits. According to obtained intelligence, the "aggressor" was planning to put an airborne assault force to the rear of troops readying for an offensive operation. It was necessary to thwart his scheme, since the assault force could draw off a considerable portion of the attacking forces.

"You will go first," the squadron commander said, peering intently at the weathered face of Gds Maj V. Kolobov.

He knew full well that the flight already had a tough job at the tactical air exercise. But the complex weather and tactical environment demanded determined actions by the most proficient pilots.

The flight's personnel prepared thoroughly for carrying out the mission. Ground maintenance specialists, headed by flight technical maintenance unit chief Gds Sr Lt A. Grigorenko, did a fine job of preflighting the fighters. The aircraft commanders received their aircraft right on schedule.

"Good luck," flight commander Gds Capt Nikolay Loparenok, a socialist competition rival, said to Kolobov.

Upon receiving clearance from the tower, the fighters took off and headed toward the mission area. Soon they spotted the targets, in spite of the heavy cloud cover. Military transport aircraft on the range were designated with parachute targets. The flight commander was the first to fly an attack pass. His attack was sure and precise. His wingman, Gds Sr Lt M. Satanovskiy, followed suit. He promptly spotted the target and hit it with his first missile. The pair in which Sr Lt S. Litvinov flew wingman also attacked confidently. Acting boldly and aggressively, the pilots destroyed the targets. Mission accomplished.

The two-aircraft elements took precautionary measures on the return flight to their home field, for it was quite possible they would encounter cover fighters.

The airfield lay ahead. The aircraft landed and taxied to the ramp. After landing the pilots learned that the flight had been given a high mark for the mock combat mission. Now they could analyze all the unexpected complications which had arisen during the air "combat." "Satanovskiy and Litvinov did a fine job," the flight commander said to himself. "Which of them should be particularly praised? I must take a look at the flight data recorder tapes."

Guards Senior Lieutenants Satanovskiy and Litvinov have long been in competition with one another. Usually the competition winner is party member Sergey Litvinov, a fighter pilot who is bold and assertive in combat. The flight commander was won over not only by his subordinate's endeavor to master to perfection combat aircraft flying technique and fully to master the skills of conducting modern air combat, but also his passionate love of parachute jumping. Sergey had made more than 100 jumps, but for the moment he was 15 jumps behind the flight commander.

Later performance results were totaled up. The performance results on mock combat missions were the principal criteria in determining placement in socialist competition. The flight of Guards Major Kolobov took first place in the squadron. The men were awarded a pennant. Many warm words were addressed to the flight commander's wingman, Gds Sr Lt Mikhail Satanovskiy. The commander was especially glad for him, for not everything had gone well for Mikhail at first. He had come to the subunit with experience flying a different aircraft, and transition training on a new aircraft always involves difficulties. The young pilot at first had problems with landings. The flight commander went up dual with him and, analyzing his subordinate's mistakes, concluded that the pilot was not keeping his aircraft on glidepath. On one landing approach he would come in high, and another time he would come in low. Both the flight commander and squadron commander had to put in extra time working with him. This proved beneficial. The combat pilot successfully mastered landings and soon began combat training on the new aircraft.

As they were leaving the classroom where competition results were being totaled up, Kolobov was about to congratulate Guards Senior Lieutenant Satanovskiy on his success. But the officer unexpectedly turned to the flight commander: "Thank you for the instruction, Comrade guards major."

Yes, one can learn a great deal from Guards Major Kolobov. His colleagues describe him in terms short and sweet: born to fly. Of course they exaggerate a bit. But Valentin Vladimirovich cannot conceive of life without aviation. It is not surprising that immediately upon graduating from secondary school he enrolled at the Armavir Red-Banner Higher Military Aviation School for Pilots. Schooling was followed by a line assignment. And now he is a flight commander.

At first it was not easy for him in his new job as flight commander. Prior to his command, the flight had been excellent-rated for several years running.

But now the flight's personnel, especially flying personnel, had undergone a considerable turnover: veteran aviators had been replaced by young men. Some people, including the flight commander, felt that the men were not presently capable of achieving an excellent rating.

The officer's attitude did not escape the notice of the squadron commander, but he could also see the capabilities of the collective.

"Do not hasten to draw conclusions; talk it over with your assistants -- the subunit's activists. You have a good grasp, and the main thing is -- rely on the collective," the squadron commander commented in a conversation with Kolobov.

Kolobov followed the commanding officer's advice. He repeatedly discussed matters with the activists. Party group organizer Gds Sr Lt A. Makhalin and Komsomol group organizer Gds Sr Lt A. Grigorenko, for example, directed his attention to such reserve potential as the excellent proficiency of the engineer-technician personnel and the friendship and cohesiveness among the aviation personnel, who were entirely capable of striving for the title of excellent subunit. Soon a discussion was held at a meeting, at which the flight commander was the keynote speaker. The officer succeeded in stirring the men up, evoking frankness on their part. Aviation personnel swung their support behind the commander and the activists and adopted tough socialist pledges.

Guards Major Kolobov skillfully guided the competition. He kept an eye on the state of affairs in each crew, promptly totaled up results, and continuously compared the results of his collective with the achievements of the neighboring excellent-rated flight under the command of Gds Capt N. Loparenok. The flights alternated the competition lead: at first Kolobov's flight surged out in front, but then their rivals moved ahead. From time to time they were forced to make up lost ground. Aviation personnel worked smoothly and harmoniously, vigorously achieving targeted goals. Gds Sr Lts V. Zheleznitskiy, A. Makhalin, S. Litvinov, and others did a fine job. These officers' men were the first to approach the excellent-rating performance level and made the greatest contribution to the success of the entire collective.

The flight commander devoted much attention to strengthening discipline among all categories of military personnel. He had to do a great deal of work, for example, with Gds Pvt V. Lagnas. This enlisted man frequently reported to work late, would be out of proper uniform, and would sometimes get into arguments with the NCO. The officer himself repeatedly talked to the mechanic, and he had his activists work with this "difficult" soldier. Gradually things began to improve.

And now a combat test had arrived -- a tactical air exercise. It demonstrated that the flight's personnel had successfully accomplished the assigned tasks. The number of excellent-rated individuals and high proficiency-rating specialists in the flight increased. For five years now the collective has maintained the title of excellent subunit.

The commander's military labor has also been rated. Guards Major Kolobov was awarded a Distinguished Service Medal for successes in combat and political training. He feels that this honor obligates him to proceed further: to improve his combat skills and to indoctrinate skilled and staunch defenders of the socialist homeland.



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CSO: 9144/565

SEEKING TO CONSERVE RESOURCES, ECONOMIZE IN AIR FORCES DAILY OPERATIONS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 7-8

[Article, published under the heading "Anticipating the 27th CPSU Congress," by Candidate of Economic Sciences Lt Col N. Karasev: "Conscientiously, With Stewardly Good Management"]

[Text] Our country and the men of the Armed Forces are actively preparing for the 27th CPSU Congress. Comprehensively analyzing past achievements, the Communist Party is making a precise scientific assessment of the present state of affairs and is making each and every Communist, each and every Soviet citizen aware of the newness and complexity of tasks facing us and is awakening in people the need to accomplish their innovative resolution.

The documents of party congresses and a number CPSU Central Committee plenums contain one of the central conclusions to the effect that at the stage of developed socialism transition to intensive methods of economic management and a sharp increase in efficiency of production are becoming an objective societal need. We shall be substantially boosting the pace of advance. At a get-together at the CPSU Central Committee with ranking officials of industrial associations and enterprises, kolkhozes and sovkhozes, leaders of production brigades, specialists, and scientists, CPSU Central Committee General Secretary Comrade M. S. Gorbachev emphasized that the degree of success with which we accomplish these tasks determines our country's socioeconomic development, strengthening of its defense capability, and improvement of life for Soviet citizens.

What objective factors dictate the need for intensification of production, that is, compel us to obtain greater output with less expenditure of material and labor resources? One should bear in mind here that a number of factors are operating in the 1980's which complicate our economic development: a decrease in the incremental growth of labor resources, an increase in outlays in connection with development of a number of areas in the eastern and northern parts of this country, the inevitable growth of expenditures on environmental protection, plus others.

Unquestionably they are directly related to growth in efficiency of societal production. To view the limited nature of material and labor resources as a

determining cause of transition to intensive methods of economic management, however, signifies, in the assessment of our party, giving an insufficient answer, lacking political-economic depth.

There is in fact a certain shortage of resources. But even if this were not the case, that is, if raw materials, fuel, supplies, and labor were available in any required quantities, would it be permissible today to run the economy with those same methods, wasteful in today's view, which are characteristic of an extensive economy? At the same time we have had and continue to have a sufficiency of many types of resources. Nevertheless today our party is raising the question of the inadmissability of utilizing them without the strictest accounting, without active concern for their conservation displayed at every step.

This matter is being successfully handled at many Air Forces aviation enterprises. For example, the workforce headed by party member officer I. Rybin has achieved good results in economizing in raw materials and fuel. This is a result of well thought-out, planned and orderly work by all echelons of management and production.

The most profound validation of the need for and possibility of increased efficiency of societal production lies in the fact that it is the very success of the Soviet economy which has placed a limit to its extensive development.

Growth of our national economy was being carried out chiefly by building more and more new plants and factories, expanding acreage planted in crops, and bringing increasing numbers of people into societal production. During the period 1922-1984, for example, approximately 45,000 production and scientific-production associations, combines and enterprises were established in this country. The quantity of agricultural land per kolkhoz [sic] [should be kolkhoz farmer?] has increased from 0.1 to 7 hectares, and per sovkhoz [sic] from 5.6 to 17 ha. The average annual number of workers and employees in the nation's economy has increased correspondingly from 6.2 million to more than 115 million persons. Of course at the same time qualitative characteristics of production also improved, its technological level rose, and labor productivity increased. Bringing of more and more new resources into exploitation, however, constituted the main factor of economic growth.

Today our economy has reached a point at which qualitative changes in it have become, so to say, a mandatory necessity. The USSR is presently turning out more industrial output than all the countries of the world in 1950. Consequently the need for intensification is dictated first and foremost by the fact that our national economy has already secured a production volume whereby in order to move forward it is necessary not so much to expand it as to accomplish updating and replacement. The productive forces embodied in the very nature of the economy of developed socialism enable us and oblige us to set for ourselves a large task of programmatic significance: to ensure that this country reaches the highest world level of productivity of societal labor. Advancement of such a task is substantiated comprehensively -- politically, socially, and economically.

First of all, as we know, V. I. Lenin considered achievement of higher labor productivity as "the most important, principal" element for the final and complete triumph of the new socioeconomic system. And in the course of improving developed socialism, when all aspects of life and affairs of the Soviet society are being consistently brought into full conformity with higher, scientific concepts of socialism, this Lenin-formulated task pertaining to labor productivity demands practical implementation.

Secondly, further accomplishment of social tasks and improvement in the prosperity of the people are possible only on the basis of labor productivity growth.

Thirdly, a course of policy directed toward achieving world primacy in the area of labor productivity is in conformity with our economic capabilities. The Soviet Union is ahead of the leading capitalist nations in growth rate of this key indicator. In the last 5 years labor productivity in Soviet industry has increased 18 percent, while the increase has been less than 5 percent in U.S. industry. This means that we are capable of overcoming the still-existing gap in this key indicator between the Soviet economy and highly-developed capitalism and of advancing forward. This year, for example, it is planned to generate almost all national income incremental growth and 95 percent of industrial output incremental growth through increasing labor productivity. Consequently the Soviet Union is approaching, step by step, a stage where all production growth in the nation's economy will be achieved by boosting labor productivity.

A brigade led by Comrade V. Shevchuk works in a Communist labor shop at a certain aircraft overhaul and repair enterprise. The team performs dynamic balancing of turbine rotors and starters. This is a complicated process, requiring great precision. And for many years now the brigade has been providing high quality of equipment repair. Recently they have achieved a considerable improvement in technical sophistication of work performed and increased labor productivity. This makes it possible to accomplish the tasks assigned to the workforce in a shorter period of time, to repair more equipment, and to increase equipment reliability.

Today economy cannot be viewed merely as some kind of an addition to continuously growing and seemingly inexhaustible material resources. Today economy or achievement of savings is becoming a most important source for securing production growth. Certain success has been achieved in this area. In the current five-year plan the national income growth rate has begun to run ahead of growth in capital investment. This is an indication that the national economy has begun to be operated more efficiently. This year additional requirements by the nation's economy in fuel and energy resources and rolled ferrous metals are being met by almost 60 percent through achieving savings and economizing. Tough targets have also been set in regard to conserving other types of raw materials and supplies.

The CPSU Central Committee approved the initiative of the Vladimir Oblast party organization pertaining to increasing the economizing of material resources. The enterprises of this oblast were among the initiators of the innovative idea of working two days this year on economized supplies, raw

materials, and fuel. Air Forces aircraft overhaul and repair workers also swung support behind them. What do two economized days give the economy? More than 3.5 million tons of coal, 7.6 billion kilowatt hours of electricity, 570,000 tons of rolled stock, and 680,000 tons of cement. Accomplishment of the assigned task forms the basis of socialist competition and countertargets for 1985. Above-target savings funds have been established at every enterprise in the oblast, kray, and republic, the proceeds from which are going for social needs, and particularly for improvement of medical care for the public.

Formulating the immediate tasks of the Soviet economy on the threshold of the 27th CPSU Congress, the party states the question as follows: by the end of the 1980's we must achieve a radical turning point in efforts to boost the efficiency of the economy and to achieve intensification of all branches and sectors. Objective preconditions for such a turning point are in evidence. Placement of the economy onto the rails of intensive development can legitimately be placed on a par with such a profound transformation as socialist industrialization, which radically altered our country's countenance.

Air Forces workforces and military collectives play an important role in the nationwide campaign for a sensible, reasonable attitude toward material goods and natural resources and for strengthening savings and economy. Aviation personnel are well aware that the level of combat readiness of our Air Forces depends not only on the volume of material and financial resources placed at their disposal but also on efficient utilization of funds allocated for defense.

This work is being conducted in Air Forces units in a persistent manner, in various forms. Lt Col V. Dorofeyev's colleagues, for example, asked themselves the following question: "Is it always advisable to run aircraft engines on the ground?" Of course this cannot be totally eliminated. However, selective study and analysis of flight data recorder tapes has revealed that aircraft powerplants run on the ground for extended periods of time in not always warranted situations. Simple calculations have shown that improvement in scheduling flight operations and beefed-up oversight to ensure timely engine startup and taxiing, as well as reduction in waiting time for takeoff clearance will help appreciably decrease the time of engine operation on the ground, thus producing certain savings in fuel and engine life. Experience confirms that with a thoughtful attitude one can achieve fuel savings not only on the ground but in the air as well.

Reasonable economies should also be observed in servicing aircraft equipment. Take, for example, the bringing of equipment to the airfield technical support station (PUATO) and service vehicle movement to aircraft. In a certain aviation unit, service vehicles once would head out onto the airfield long before operations commenced. Truck motors, especially in winter, would stand idling, producing no benefit as regards dispensing of gasoline, and engine service life was being used up. It was determined that this could be avoided by precisely calculating the time required to service aircraft, by devising efficient service vehicle movement routes, and by adopting a precise schedule

of vehicle movement out to the airfield. All this will produce considerable savings.

In vanguard aviation units considerable attention is devoted to intensification of the instructional process and an extensive search for reserve potential for achieving savings in resources. Considerable savings are achieved, for example, by having aircrews practice appropriate drills on combined simulators prior to training sorties, which ensures a certain decrease in the number of training flights. And as we know, the cost of an hour of practice on the simulator is from 7 to 9 times cheaper than the cost of a training flight.

Intensification of efforts in line units to achieve savings and increased efficiency of utilization of resources allocated for defense represent a substantial contribution toward the nationwide cause of intensification of our economy and to preparations for honoring the 27th CPSU Congress in a worthy manner.



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CSO: 9144/565

IDEOLOGICAL INDOCTRINATION WORK IN BELORUSSIAN MILITARY DISTRICT

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 9-10

[Article, published under the heading "From Party-Political Work Experience," by Maj Gen Avn Vasiliy Semenovich Zalivin, member of military council and aviation political department chief, Red-Banner Belorussian Military District: "Ideological Support of Combat Training"]

[Text] The aviation personnel of our Red-Banner Belorussian Military District, just as the entire Soviet people and members of the Armed Forces, are making preparations in an atmosphere of great labor and political enthusiasm to honor in a worthy manner the forthcoming 27th CPSU Congress.

We are compelled to carry out the tasks assigned by the Communist Party in conditions of unabating military danger and acute ideological struggle. Militant forces of imperialism would like to tip the military strategic balance in their favor. They place high hopes on programs calling for the expansion of nuclear and conventional arms, militarization of space, and undertaking of large-scale efforts to design and build antimissile defense systems. A prominent role is assigned to the air forces of the United States and the member nations of the aggressive NATO bloc in carrying out the global hegemonic policy of imperialism.

The complicated international situation demands of Armed Forces personnel, including military aviation personnel, the highest degree of vigilance, tenacity, firmness, and unrelenting attention toward strengthening the combat readiness of units and subunits.

Our district's military aviation personnel are constantly improving their combat skills, are working persistently to master the formidable modern aircraft and weapons, and are in a continuous state of combat readiness.

A high degree of political consciousness on the part of pilots, engineers, technicians, junior aviation specialists, their total dedication to the party and homeland, their readiness and willingness to carry out combat orders are determined in large measure by the level of ideological work conducted in the units and subunits. Tasks pertaining to its organization in present-day conditions are formulated in the CPSU Central Committee decree entitled "On

Further Improving Ideological and Political Indoctrination Work" and in the proceedings of the 26th CPSU Congress and other party documents. An important role in determination of the main directions and major tasks for improving ideological work was played by the June (1983) CPSU Central Committee Plenum. Unquestionably, it was noted at this plenum, ideological activities per se cannot solve economic and social problems. One should not ascribe attained successes to ideological activities alone, nor should they be exclusively blamed for existing deficiencies. Only a blending of ideological indoctrination work with political, organizational and administrative-management activities produces the required effect.

Proceeding from the party's demands, district aviation commanders, political agencies, and party organizations are intensifying the practical directional thrust of ideological work and are focusing it on achieving high end results, effective accomplishment of combat training tasks, and further strengthening of military discipline.

The entire system of instruction and indoctrination of aviation personnel constitutes the basis of their moral-political and psychological training. Methods of influencing personnel which have been tested and proven by practical and combat experience are utilized in the units, including all forms of ideological work, commander training, dissemination of military-technical knowledge, etc. We are also continuing the search for the new and support useful initiative. We consider the main thing, however, to be enrichment of these tested and proven methods of indoctrination and instruction with new content, taking into account many important items and demands placed on the Air Forces by the CPSU Central Committee and USSR minister of defense.

The principal aim of moral-political, psychological, and professional training of aviation personnel is to develop convinced, ideologically staunch combat pilots who are dedicated to the homeland, who skillfully utilize all spiritual and intellectual abilities to gain victory. These as a rule are experts, who possess a consummate mastery of modern aircraft and weapons, who are prepared at all times and in all conditions to utilize these weapons with the greatest effect.

The foundation of all work pertaining to moral-political training of aviation personnel is indoctrination in the ideas of Marxism-Leninism.

Ideological conviction is formed chiefly in the process of political training of personnel. We enlist respected leader-Communists to conduct such training classes, persons with a high level of theoretical and methodological training and appropriate experience in working with others. The practice of holding monthly talks for propaganda activists by leader personnel, which has proven quite effective, has become firmly established in the units and subunits. These talks are devoted to progress in combat training and achievement of adopted socialist pledges, analysis of the state of military discipline, unresolved problems and bottlenecks requiring stepped-up ideological influence and activation of political indoctrination work. Such get-togethers make it possible to focus activists toward more thoughtful and high-quality performance of ideological measures and solid securement of their linkage with accomplishment of specific combat training tasks.

Volunteer propagandists officers V. Nevestenko, A. Orlov, S. Ryaboshapka, A. Alipov, and others enjoy deserved respect in the collectives. Proficient methods specialists, they work skillfully with their students. Classes in their groups are lively, interesting, and purposeful. Devoting considerable attention to matters pertaining to ensuring flight safety, these comrades demonstrate with specific examples, on the one hand, how important it is to preflight aircraft in an excellent-quality manner, and on the other hand the potential consequences of negligence and carelessness in performance of one's job duties, and they draw the men's attention to the need to increase a sense of personal responsibility for the assigned task. This produces good results: for many years now safe flight operations have been steadily maintained in the unit.

Political training of personnel in units performing an important mission pertaining to guarding the homeland's airspace is supplemented to a great extent by theoretical and scientific-practical conferences, discussions and tasks with officers and warrant officers on guideline documents of the Communist Party and Soviet Government, and on articles in the periodical press.

Such measures are conducted in an interesting and content-filled manner, for example, in the unit in which Maj B. Dotsenko is a propagandist. In this unit they also conduct for flying personnel classes to study the theater of operations and aircraft in service with the armed forces of the aggressive NATO bloc. Considerable attention is also devoted to get-togethers between aviators and servicemen of other occupational specialties. They offer a great deal, and particularly help improve teamwork and cooperation in flying training sorties. Each such measure as a rule has a counterpropaganda directional thrust, helping develop a correct ideological position.

There are many interesting and instructive elements in the practical work of the officers' club council headed by Maj G. Ivanov. In order to provide moral incentive to military personnel standing alert duty and to mobilize them for flawless performance of their job duties, the club regularly holds evening events honoring the top pilots and technicians and initiation days for ushering young pilots into the ranks of sentinels of our country's airspace.

Dissemination of advanced know-how in standing alert duty is being more and more solidly incorporated into the practical activities of district aviation political agencies, party and Komsomol organizations, with extensive utilization for this purpose of all forms of verbal and visual agitation, the wall press and technical means. The employed forms of ideological support of this important area of combat training have enabled us solidly to achieve those performance levels specified by standard indices.

The international situation, which has become aggravated through the fault of imperialist circles, compels us to carry out ideological and political indoctrination work more aggressively and purposefully, work directed toward ensuring a high degree of combat readiness on the part of units and subunits, especially during flight operations and tactical air exercises. Such an area as indoctrination of aviation personnel in combat traditions is being strongly

emphasized in this work in the year of the 40th anniversary of Victory of the Soviet people in the Great Patriotic War.

Specific examples of heroism engender in young aviation aviation personnel a feeling of pride in the glorious deeds of the older generation and arouse in them the endeavor to emulate the exploits of their elders and help them more deeply comprehend their role in the campaign for new military achievements and further increase vigilance and combat readiness. But combat traditions are not only remembrance of a heroic past but also an expression of a living link with the present. Such work forms as competition among young pilots for the privilege of being the first to solo a combat aircraft, to fly a sortie in the place of a regimental hero, honoring of pilots who have done an excellent job on a flight assignment, entry of their names into the symbolic flight logs of fellow members of the regiment Heroes of the Soviet Union B. Okrestin, P. Stefanovskiy, V. Istrashkin, and others have become widespread in the aviation units and subunits.

In the unit in which political worker officer V. Grigor'yev serves, for example, they have drawn up provisions for competition among young pilots for the privilege of flying a training sortie in honor of Hero of the Soviet Union B. Okrestin. The winning crew is determined each month on the basis of quality of performance of flight assignments and preparation of aircraft, observance of safety procedures, state of military discipline, and participation in volunteer work. All this produces good results. Young aviators quickly become broken in and carry on with honor the fine traditions of the older generation.

Dissemination of military-technical knowledge occupies an important place in the work of commanders, political workers, party and Komsomol organizations of district aviation units and subunits, work directed toward further improving instruction, political and military indoctrination of personnel. It helps improve the quality of instruction and fosters development of innovative activeness on the part of military personnel in the campaign to maintain a high degree of combat readiness. As we know, sure mastery of combat equipment and weapons by military personnel is not only the way to achieve military-professional superiority over the adversary but also an important condition for their excellent moral-political and psychological readiness to wage combat in today's war. It is for good reason that today the terms "staunch" and "courageous" are integrally linked with the terms "skilled" and "knowledgeable."

Dissemination of military-technical knowledge is an entire aggregate of measures in any of our units. Experience indicates that the main thing here is coordinated activity on the part of all components and an organic link between conducted measures and combat training tasks. We utilize various forms in this important, critical activity. Technical lecture series, study groups, and schools of advanced know-how, for example, have become quite widespread. Military-technical knowledge sections have been formed in agitation-propaganda collectives and agitation-propaganda groups; these sections organize lectures and presentations on scientific and technological advances and acquaint the men with new developments in aircraft equipment and future development prospects. Technical information bulletins are regularly

put out in the overwhelming majority of regimental technical maintenance units, in which matters pertaining to maintenance of aircraft systems and their high-quality repair are discussed. Such well-proven forms of military-technical dissemination as technical quizzes, question-and-answer evenings, exchange of know-how of advanced methods of servicing and maintenance of aircraft and armament, and honoring of high proficiency-rating specialists are also utilized with success.

Practical experience shows that well thought-out dissemination of military-technical knowledge helps aviation personnel accomplish combat training tasks in an exemplary manner, helps them improve their flying proficiency, helps develop in them a love of aircraft equipment and a strong sense of responsibility for operating and maintaining it knowledgeably and safeguarding it in an exemplary manner. There are many examples which confirm the fact that excellent technical knowledge ensures high-quality performance of flight assignments and in difficult situations enables one quickly to make an intelligent decision. Once Lt Col V. Shabalin found himself in a difficult situation. The circumstances demanded of him excellent knowledge of his aircraft, superior flying skill, courage and composure. Later, when the aircraft was safely on the ground, maintenance specialists noted that the decision he had made was the only correct one. By ukase of the Presidium of USSR Supreme Soviet, party member Lt Col V. Shabalin was awarded the Order of the Red Star for courage and bravery displayed in the performance of military duty.

In order to increase the effectiveness of ideological work and strengthen its link with practical realities, it is important that it be carried out to the airfields, flight lines, technical maintenance units, vehicle pools, that is, wherever personnel are on the job, and that it be conducted in a close link with tasks being performed at a given time and at a given place. We have made sure that party-political work zones have been set up at every airfield. "Advanced-Know-How Forums" are set up in a prompt and timely manner in control towers and on aircraft flight lines, current news sheets and combat glory bulletins in honor of distinguished-performance personnel are put out on a regular basis, and special radio newspapers are broadcast, entitled "Combat Readiness at All Times, Vigilance in All Places!" A certain amount of work is also been done to set up airmobile field Lenin rooms and flight-line shacks, and on providing the body of propaganda activists with everything they need to operate in field conditions.

At the same time one cannot ignore the fact that in some places measures which in general are correct and substantial are carried out for the most part at the unit level, while they are rare in the subunits, the places where success is primarily determined in accomplishing combat training tasks, strengthening military discipline, and unifying military collectives. We consider improvement in the quality of indoctrination measures conducted directly in the subunits as a reserve potential which enables commanders, political workers, and party organizations to boost to an even higher degree the effectiveness of training and military discipline and to achieve further increase in the conscientiousness and combat activeness of military personnel.

At the present time the Communist Party is demanding that each and every leader master a Leninist work style and the Leninist science of management. In the conditions in our military these comprise a set of principles and methods of leadership which provide the capability to mobilize the men with maximum success consciously to carry out the demands of the party and government and to increase combat readiness. We therefore endeavor to develop in leader-officers a businesslike efficiency and ability to organize the job-related activities and training of personnel in precise conformity with the provisions of regulations, orders and documents governing flying activities.

As we know, genuine efficiency is inconceivable without knowledge of the men, without the ability effectively to utilize their experience and skills, and the capabilities of the entire collective as a whole. Precisely these qualities distinguish vanguard district aviation political workers officers L. Popchenko, G. Savushkin and others, who are concentrating the men's attention on the main thing with the aid of a vast arsenal of forms and methods of ideological and political indoctrination work, who work with an eye to the future, and who are achieving tangible end results.

Practical realities and political indoctrination work with personnel indicate how important it is that indoctrination be handled by people who possess a well-developed sense of the new, who have the ability to organize their assigned task. Not all leader-Communists, however, are yet fully cognizant of the importance of personal participation in ideological indoctrination activities or fully appreciate its role in teaching and indoctrination of servicemen.

Deficiencies in combat training, political and military indoctrination, which exist in some of our collectives, are a consequence of the fact that they have not yet solidly established an efficient system of indoctrination work with various categories of military personnel, especially directly in the subunits. In the unit in which officer V. Anisov serves, for example, the state of affairs was analyzed in a shallow and uncritical manner, and complacency was displayed, while the interests of the matter at hand required strengthening ideological influence on personnel. These shortcomings are now being corrected, but intervention by the political agency was required to accomplish this.

Practical experience indicates that there are no "pure" organizers and "pure" propagandists. As was emphasized at the June (1983) CPSU Central Committee Plenum, ideological work is the job of each and every Communist. And if anybody considers otherwise, sooner or later he will come up against serious difficulties in his activities. All these are aspects of a single issue, a single problem. We set for ourselves the following goal in resolving this problem: to ensure that organizational, ideological, and political indoctrination work is conducted in an indissoluble unity. Herein lies a

guarantee of improvement of combat training, the forming and shaping of an individual with communist convictions.



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CSO: 9144/565

SOCIALIST COMPETITION HELPS COMBAT SQUADRON BOOST PERFORMANCE

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 11-12

[Article, published under the heading "The Squadron -- Center of Ideological Indoctrination Work," by Military Pilot 1st Class Squadron Commander Lt Col I. Gryazev: "Lift"]

[Text] At a tactical air exercise our squadron was assigned the mission of destroying small targets on the range. The combat pilots took off one after the other. The aircraft flown by Military Pilots 2nd Class Capts A. Yeshkov and M. Kononykhin -- rivals in socialist competition -- also rose skyward. Both officers were anxious to perform the mission as well as possible.

This tactical air exercise became for them a serious test of proficient flying ability. And we must state that, in spite of aggressive countermeasures by the simulated adversary and in spite of the fact that the ground targets were concealed and camouflaged, the aviators successfully accomplished the assigned mission. They delivered the strike with complex maneuvers. Captain Yeshkov laid his bombs right into the middle of the target, and Captain Kononykhin hit the target accurately with cannon fire.

Of course these pilots did not gain proficient combat skills instantly. But there is no doubt that mutual rivalry considerably hastened their professional development. The officers themselves are also firmly convinced of this. I remember that M. Kononykhin, our party secretary, said at a meeting of the party buro: "Competition for aviators is the same as lift on an aircraft."

Lift.... An apt comparison! It helped us achieve the title of excellent squadron. Thanks to competition one can direct the creative energies of aviators toward achieving excellent end results.

I shall discuss in greater detail how competition is organized in our subunit. Although the squadron has earned the rating of excellent, we can achieve more, for there can be no stopping in the campaign for a high degree of combat readiness. Prior to commencement of the new training year we thoroughly analyzed our capabilities and specified new, higher performance levels in competition. In determining our tasks we were guided by the decisions of the 26th CPSU Congress, subsequent CPSU Central Committee plenums, by the Central

Committee decree entitled "On Improving Organization and the Practice of Totaling up Socialist Competition Results and Rewarding Competition Winners," and by the demands of the USSR minister of defense and commander in chief of the Air Forces.

We approached working out pledges taking into account the realistic capabilities of each pilot and technician. There was an instance in the squadron when young pilots Sr Lts G. Krokhmalyuk and I. Sokhnenko, endeavoring not to be found wanting, as they say, targeted for themselves somewhat excessive performance levels. Of course the officers proceeded from the position that pledges must be tough. But they failed to consider another factor: pledges should be substantiated, be based on already achieved results in combat and political training. And we leader-Communists failed to point out their mistake in a prompt and timely manner. As a result Krokhmalyuk and Sokhnenko did not fully accomplish their pledges, and this affected the squadron's overall competition results.

We drew correct conclusions from what had happened. And now we think through and discuss individual socialist pledges with each aviator. We endeavor to ensure that they precisely specify: exactly what people are promising to accomplish and on what timetable, who is competing with whom and for attainment of what results. Capts V. Yelkhov and A. Yandin, for example, are skilled combat pilots and are successfully preparing to take the tests for the 1st class rating. There was every reason to advise them to compete with each other. Or take aircraft technicians Sr Lts G. Murkin and V. Simonov. Their level of training is also more or less the same. These officers graduated from service school at the same time and began line service in the squadron together. After some time they became specialist 1st class. Are they not perfectly-suited competition rivals?

These as well as many other aviation personnel in the subunit are now successfully competing in boosting proficiency level. Their pledges are now realistic, directed toward achieving higher performance levels in combat improvement.

Devising and adopting pledges which are both tough and within reason is an important stage, but it is only the beginning stage in organizing competition. The main and perhaps most difficult stage of course consists in mobilizing the men for their practical achievement. As experience shows, vigorous and purposeful indoctrinational and organizational work by the commander, political worker, and all leader-Communists is required here, as well as unswerving observance of Leninist principles of organization and socialist competition.

Our own experience has convinced us how important it is to inform the men on competition developments in a prompt and timely manner, for each aviator wants to know the state of affairs in the collective. Of course in addition to his own successes he is interested in the achievements of his comrades: what have they achieved during the period of a day, week, or month, who is keeping his word and advancing at the forefront, and who needs to toe the line and where?

In the past we also devoted constant attention to matters of publicity. Certain experience was amassed. Relying on this experience, we are continuing an aggressive search for reserve potential in ensuring competition publicity. At the present time it is not only in totaling up results but also in the process of training that flight commanders and group chiefs endeavor to commend outstanding performers and set up as an example those pilots and aviation engineer service specialists who are working to the full extent of their ability. Party activists are immediately organizing exchange of know-how, in the course of which leaders in training and job performance tell about ways to achieve the stated goal.

Efficient work by activists has produced results. When a tactical air exercise would be held in the unit, many aviation engineer service specialist would mission-ready combat aircraft with excellent quality and extremely rapidly.

Matters pertaining to publicizing the experience and know-how of the top personnel have also taken a leading position in visual agitation materials, which recently have become even more practical and content-filled. Activists prepare them skillfully and tastefully. A great deal in this regard is being done by Capt M. Kononykhin and Sr Lt I. Uvarov. They regularly put out wall newspapers and outstanding performance publicity sheets devoted to competition leaders. Thanks to this it becomes clearer against whom one should measure performance, from whom to take an example, and who should be helped.

While concerned with widely publicizing the experience and know-how of the best specialist personnel and actively adopting this know-how into practice, at the same time we do not forget about another aspect of the principle of publicity -- criticism of lagging performers and persons who are not conscientious about doing their job. Command authorities, party and Komsomol organizations take sternly to task those who do not work at full effort, who work listlessly. We discuss them at meetings and conferences. I shall note that in the majority of cases criticism directed toward our colleagues in the final analysis helps them correct their shortcomings.

Such was the case, for example, with party member Capt A. Yeshkov and Komsomol member Sr. Lt P. Godynyuk. They adopted ambitious pledges, but worked with insufficient zeal and persistence toward accomplishing them. Yeshkov caused a near-accident situation in the air, while Godynyuk did not always conscientiously carry out the requirements of aviation engineer service regulations. The fact is, there was plenty to discuss with these comrades both in the course of their duty and at squadron party buro and Komsomol Buro meetings. Their colleagues took them sternly to task for shortcomings in their work, demanded that they show greater responsibility for meeting socialist pledges, and advised them on how to correct shortcomings. We must say that these measures had an educational effect. These comrades have now corrected most of their deficiencies and are in good standing with the subunit.

Another principle of organization of competition is closely linked with competition publicity -- comparability of results. Guided by them, we comprehensively take account of the true state of affairs on the part of

competition rivals and thoroughly analyze their achieved results and the degree to which they are in conformity with stated performance goals. Now things are handled in this way, but previously things were different. Usually they would take performance indices achieved by flights, groups, individual pilots or aviation engineer specialists competing with one another, would compare them "by eye" and name the winners. They would frequently forget about the lagging performers. Naturally there was little benefit derived from such comparability. Therefore it was necessary to reorganize things and make appropriate changes.

We have set up more accurate record keeping on the performance achievements of aviation personnel for each day and week. We utilize these figures in adding up competition totals for the month. Such records can provide a great deal of information. Now in totaling up results, for example, Capt A. Bakhvalov, chief of an excellent-rated group, can not only compare the performance results of Air Forces master proficiency-rated warrant officers V. Shiyanov and N. Savichev, but can also reproduce in detail how each of them proceeded toward the stated goal, who was successful in what, and how each achieved success. On the basis of these figures we can reproduce in detail the course of competition, upward and downward trends by each in training, and we can specifically compare performance results of competing personnel. This enables us more objectively to evaluate the quality of achievement of socialist pledges by aviation personnel.

We have also begun more fully utilizing objective monitoring data, especially in those cases where, with equal results achieved in competition, it is difficult to give the edge to any of the competitors. To illustrate, Capts V. Yelkhov and A. Yandin, competing in high-quality performance of takeoffs and landings, in the opinion of the flight operations officer were equally successful in accomplishing the assigned tasks. How does one determine a winner? At this point we were assisted by an impartial judge -- the flight data recorders. The data recorder tapes this time gave the nod to Yandin.

I believe, however, that one should not get carried away with numerical data, no matter how accurate it may seem, for behind dry statistics one sometimes fails to see a living person. In order that this not happen, it is important constantly to bear in mind the moral and ethical aspect of competition, its indoctrinational role. I shall not deny that we have made some errors in this matter, such as the one involving Capt V. Tarasov, who at the time was serving as an acting electronic equipment group chief. The officer was professionally knowledgeable, but he failed to put out adequately diligent effort and was not distinguished by personal discipline, which in the final analysis led to serious problems. And we leader-Communists were unable to put the officer on the straight and narrow in time. This was a highly instructive lesson, and we drew the proper conclusions from it.

We now devote greater attention to people's moral and ethical qualities. Indicators of individual intellectual growth, organization, discipline, and participation in the collective's volunteer activities have become an effective criterion for competing personnel. We also consider how people conduct themselves off duty and what their comrades think of them. Once, for example, when comparing the performance results of Capts V. Volokh and A.

Zhukov, we first wondered who should get the nod. The officers' personal performance achievements and indices in indoctrination work with subordinates were approximately equal. Opinions differed. At this point the party buro members expressed their opinions: Zhukov was sometimes impetuous, and he rarely visited the barracks. These factors were taken into consideration, and the nod was given to Capt V. Volokh, who was distinguished both by mature professional skill and the ability to work with subordinates.

Efficiently-organized competition provides for the possibility of practical emulation and extensive dissemination of advanced know-how. Basically we are successfully accomplishing this task. The initiative of the party activists, led by Capt M. Kononykhin, is manifested most clearly and distinctly here. Operating in close contact with the squadron command authorities, they gather up bit by bit all valuable innovations adopted by competition right-flankers and aggressively publicize and adopt their know-how in the collective. Military Pilot 1st Class Capt V. Voznyuk, for example, commander of an excellent-rated flight, addressed his fellow soldiers through the initiative of the members of the party buro. He reminded his audience of the specific features of cross-country flying at night in bad weather. The discussion was continued by another 1st-class pilot, Capt V. Vasilenkov, who related to the aviators how he executes a landing in such conditions and where particular attention should be focused.

Activists synthesized the work know-how and experience of party members in the aircraft equipment group headed by Capt V. Volokh. This enabled young aviation engineer service specialists to see how competition leaders were able to shorten the time reduced to ready equipment for flight operations and how they are succeeding, thanks to skilled organization of labor, in performing all operations in a high-quality manner and with minimum expenditures of material resources.

We also hold technical quizzes and regularly organize demonstration classes. Aviation personnel always display heightened interest in such activities. They are conducted by such experienced specialist personnel as the squadron's top efficiency innovator, Captain Koshevoy, from whom one can learn a great deal. Komsomol members specialists 1st Class A. Tokovenko, L. Tserebeyus, and others also take active part in their conduct. They skillfully service aircraft and are able to tell their comrades about this in an easily understood manner.

Presently, in the course of intensive combat training, one is particularly clearly aware of the magnitude of the role of competition in training and indoctrinating personnel. Taking part in this competition, aviation personnel are displaying their finest qualities and growing professionally, morally and ethically. All this gives reason to hope that the tough socialist pledges adopted by our collective in honor of the 27th CPSU Congress will be successfully achieved.



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CSO: 9144/565

SWEPT-WING AIRCRAFT LIFT AUGMENTATION DEVICES ANALYZED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 29-30

[Article, published under the heading "Practical Aerodynamics for the Pilot," by Doctor of Technical Sciences and Professor Maj Gen Avn M. Nisht: "Effectiveness of Wing Lift Augmentation"]

"[Text] A high wing sweep angle, low aspect ratio, small wing area and relative wing thickness, typical of modern supersonic aircraft, diminish lifting properties on takeoff and landing and worsen takeoff and landing characteristics. Since angles of attack on takeoff and landing are limited due to design and operational considerations, effective lift augmentation -- trailing-edge flaps of various type -- is employed to improve aircraft takeoff and landing characteristics. Flap deflection increases wing curvature and boosts the lift coefficient. But they are little effective on low aspect-ratio and highly-swept wings.

The fact is that flap lift coefficient increase DeltaCy depends not only on shape, size and deflection angle, but also on wing planform. Figure 1 illustrates lift coefficient increase with deflection of flaps by the same angle delta-f on low aspect-ratio and highly-swept wings and high aspect-ratio and low-sweep wings (DeltaCy2<DeltaCy1). Increase in DeltaCy depends on coefficient C-yx, which decreases with a decrease in aspect ratio and an increase in wing sweep angle.

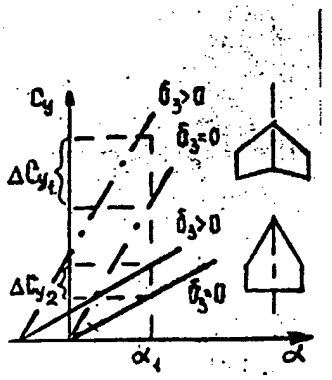


Figure 1.

Employment of variable-sweep and complex planform wings makes it possible to increase flap effectiveness to some degree. On such wings flaps are placed in the outboard sections, which have little sweep angle and a high aspect ratio. Even in these cases, however, their effectiveness is limited -- when deflected at considerable angles (to increase DeltaCy), flow separation from the wing surface occurs, and the aircraft's moment characteristics (stability and controllability) appreciably worsen.

To combat this undesirable phenomenon, especially during takeoff and landing, modern aircraft, including those with wings with an inboard leading-edge extension, employ leading-edge lift-augmentation devices -- leading-edge flaps, slots and slats. When these devices open (extend), a slot is formed between them and the wing (Figure 2). Flowing through it from the lower to the upper surface of the wing, the airflow increases velocity in the boundary

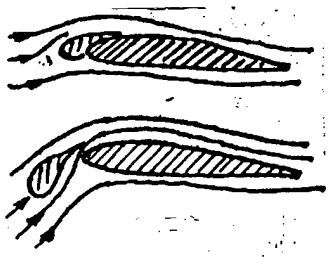

Figure 2.

layer and delays separation. As a result critical angle of attack alpha-cr and coefficient of maximum lift Cy-max increase (Figure 3). A more important

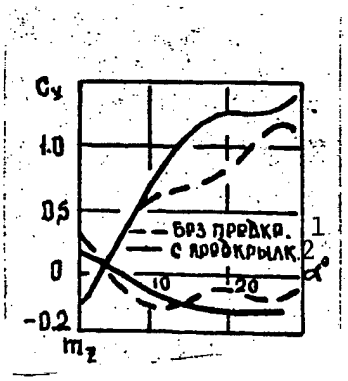


Figure 3.

Key: 1. Without leading-edge lift-augmentation device; 2. With such a device

function of leading-edge lift-augmentation devices, however, is to eliminate wingtip stall in landing and takeoff configurations and to improve moment characteristics. In particular, it is evident from Figure 3 that a leading-edge lift-augmentation device prevents "flattening out" of relation m-z(alpha) in takeoff and landing configuration (alpha ~ 10 degrees) and shifts it to high angles of attack (alpha > 20 degrees). The effectiveness of trailing-edge flaps, ailerons and spoilers also increases.

Deflection of the wing leading edge alters the leading-edge curvature, ensures smooth airflow at high angles of attack (Figure 4), and makes it possible (just as slat extension) to eliminate buffeting, to increase critical angle of attack and coefficient Cy-max, to increase the efficiency of lift-augmentation devices and controls, and to improve the aircraft's moment characteristics. As we know (see article "With a Wing of Complex Shape," AVIATSIYA I KOSMONAVTIKA, No 4, 1985), inboard leading-edge extension vortices can adversely affect airflow across horizontal and vertical tail surfaces and worsen an aircraft's moment characteristics. Deflection of leading edges on the inboard leading-edge wing extension diminishes the intensity of leading-edge vortices, alters their position in relation to the tail, and thus helps improve both the aircraft's roll and yaw moment characteristics. The greatest effect is produced by deflecting the leading edges to angles ensuring shock-free (tangential) airflow entry onto the wing leading edge. But since on a finite-span wing angles of attack are different at different wing sections, the required leading-edge deflection angles should also differ. In addition, they are dependent on angles of attack and deflection of trailing-edge flaps delta-f.

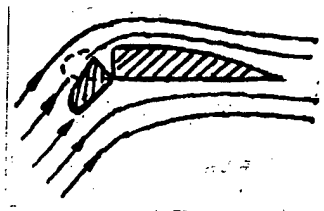

Figure 4.

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Change in requisite leading edge deflection angles delta-l moving toward the tip on the outboard section of a complex planform wing with an inboard lead-edge extension, at different angles of attack and trailing-edge flap deflection angles, obtained by calculation, is illustrated in Figure 1 on the back cover [not reproduced]. Since angles delta-l change considerably as one moves tipward, one can achieve for practical purposes shock-free flow entry on the leading edge only by dividing the wing leading edge up into separate sections deflected to different angles with the aid of special automatic devices.

The ability of trailing-edge flaps to increase an aircraft's lift has long been known. Why is it, however, that until quite recently they were used only

on takeoff and landing and were not employed in flight, particularly during maneuvering?

The fact is that when a trailing-edge flap is deflected (Figure 5), normal force Nf which is generated on it increases not only lift (Yf > 0) but also drag (Xf > 0). The aircraft's lift-drag ratio, however, decreases.

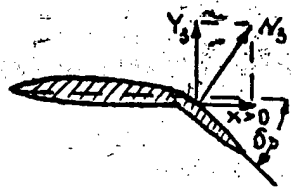


Figure 5.

The situation is different with leading-edge deflection (Figure 6). Normal force Nl forming on the leading edge increases lift (Yl > 0) and decreases drag (Xl < 0). As a result the aircraft's lift-drag ratio increases. Corresponding to each angle of attack alpha is a quite specific leading edge deflection angle delta-l which ensures shock-free flow entry onto the leading edge (Figure 7a). If this is not achieved, there occurs flow separation from the leading edge (figures 7b and c), lift decreases, drag increases, and the lift-drag ratio decreases.

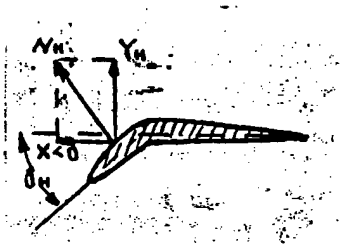


Figure 6.

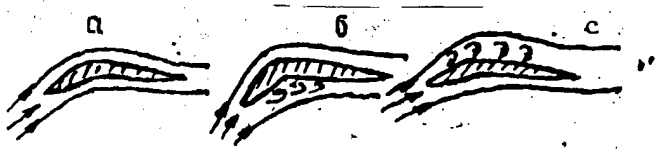


Figure 7.

The greatest effect is produced by simultaneous deflection of trailing-edge and leading-edge flaps. In this case the trailing-edge flaps produce a substantial increase in lift, while the leading-edge flaps decrease drag. Induced-drag polar passage improves as a result -- it displaces leftward. In other words, with one and the same value of lift coefficient Cy, one obtains a smaller value of induced-drag coefficient Cxi (Figure 2 on back cover) [not reproduced], which produces an increase in the lift-drag ratio, especially at high angles of attack (Figure 3 on back cover) [not reproduced]. In addition, the aircraft's moment characteristics improve.

Employment of effective lift augmentation devices considerably improves not only an aircraft's takeoff and landing characteristics but also its maneuver characteristics.



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CSO: 9144/565

MAINTAINING SENSE OF AIRCRAFT HEIGHT ON APPROACH GLIDEPATH

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) p 30

[Article, published under the heading "Flying and Psychology," by Military Instructor Pilot 1st Class Candidate of Technical Sciences Lt Col N. Litvinchuk: "Why the Pilot 'Lost' the Ground"]

[Text] As we know, landing is the most complicated phase of aircraft flying. A pilot's professional skill is judged by how he lands. And a pilot, no matter how many years he has flown, works on improving his landing skills throughout his entire career.

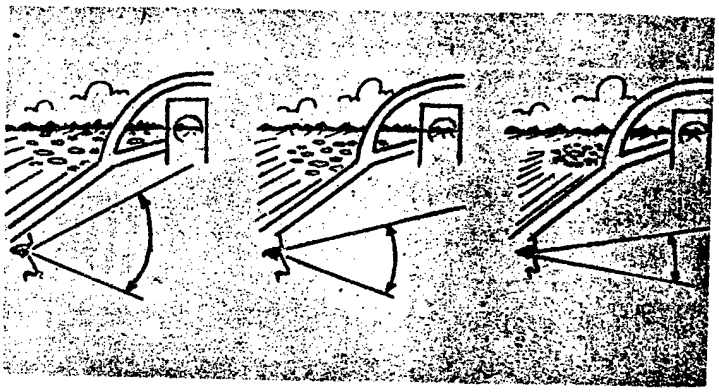
In training pilot cadets at service school, the instructor pilot expends a great deal of effort on teaching the student pilots to "see the ground" during a landing approach or, more precisely, to determine distance to the ground in order to put the aircraft into touchdown attitude promptly and accurately, subsequently putting it down softly onto the runway. It sometimes happens that a student pilot who has done a good job of mastering the techniques of handling an aircraft in the air, makes mistakes on his landing which prevent the instructor from approving him for solo. "He does not see the ground," the instructor concludes. Sometimes because of this a pilot cadet who sincerely loves flying is forced to give it up.

Sometimes pilot cadets who have already soloed suddenly begin to make mistakes on landing approach which present the possibility of accident. In addition, even veteran pilots "lose the ground." Frequently this happens after an extended interval without having flown, during a check flight, when a senior-level officer is in the instructor's seat. This happens most frequently when the pilot is experiencing considerable psychological stress.

Flying experience and many years of observations suggest that a student pilot's inability to master landings and a pilot's "loss of the ground," from the standpoint of psychophysiological features, are common in nature and directly linked with the ability to perceive visual information.

An article entitled "Runway Under the Aircraft" (AVIATSIYA I KOSMONAVTIKA, No 10, 1984) examined the process of estimating flight parameters during a landing approach. The pilot determines the rate of ground approach and

distance to the ground by the "sheaf" of recession and angular rate of approach. Optimal reception of information is possible when the "sheaf" is fully within one's field of view, in other words, when the gaze encompasses a large area of ground surface (see figure). But if a pilot wants to see something better, he narrows his field of vision, which increases visual acuity. As a result, on his landing approach the pilot clearly sees objects in the direction of his gaze, but monitoring of the "sheaf" degrades. Naturally monitoring of height and its derivatives also degrades. Various errors occur as a result: high roundout, coming in low on glidepath, float, and "ballooning."



Figure

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Once it begins, such a phenomenon can become worsened. And the more the pilot tries, the worse it gets. It continues until he involuntarily sees the requisite picture. And everything immediately takes its proper place. But sometimes too much time passes while a pilot acquires the requisite skill in the course of flying practice. Rote drill is too costly a method of "seeking the ground," that is, correcting landing approach errors.

Usually after the instructor notices that his student has "lost the ground," he conducts additional practice and drill with him, shows him where to look and how, and tests him in the air. There are also other effective measures which are employed in the process of flight training. As a rule, after this the habit is reestablished.

Thus the primary cause of "losing the ground" consists in a pilot's endeavor to see it well in a natural manner. But nature has not adapted man to normal orientation in conditions of rapid displacement in space. He obtains his bearings by conscious mental exertion, concentrating attention on some specific area. In other words, in artificially created conditions man operates with his reserve capabilities. The conflict consists precisely in this: in a normal situation one must narrow one's field of vision to see better, while on a landing approach the field of vision must be widened to see better.

Consequently, in order correctly and consciously to form the skill and habit of perceiving the ground on a landing approach, it is necessary to know the mechanism of its formation. Medical doctors and psychologists can also contribute to the picture. In any case, in order for the "pilot-aircraft-environment" system to function reliably, we need a conscientious and aware approach to flight training and thorough ground training and practice, especially following lengthy interruptions in flying. This should not be forgotten, for sometimes the cost of a mistake is too great.



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CSO: 9144/565

NEW BASIC AF TEXTBOOKS ON AERODYNAMICS, FLIGHT DYNAMICS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) p 32

[Article, published under the heading "Recommendations of Science Into Practical Training and Instruction," by Doctor of Technical Sciences and Professor Lt Gen Avn S. Belotserkovskiy, recipient of USSR State Prizes: "Source of Basic Knowledge"]

[Text] It is for good reason that aerodynamics is given a central position in the "technique-aerodynamics-tactics" formula for flying personnel theoretical training. Aerodynamics is of special, applied significance. A pilot who does not possess solid knowledge in the area of aerodynamics, dynamics of flight and practical aerodynamics will be unable to master the technique of flying a specific aircraft, to operate it with total mastery in any and all weather conditions and in the most complex tactical environment.

Usually the term aerodynamics is applied in aviation as an encompassing term, covering three essentially different concepts: aerodynamics proper, flight dynamics, and practical aerodynamics of aircraft (airplanes and helicopters).

Aerodynamics is the science of the laws governing the motion of gases and their force effect on the surface of streamlined bodies. Its principal aim is study of the specific features of the aerodynamic data of airplanes, helicopters, and their parts. The forces and moments acting on an aircraft in flight are the principal aerodynamic characteristics. Airplanes and helicopters are able to fly and execute combat maneuvers precisely due to aerodynamic forces. And the moments generated by these forces provide the stability and controllability of every aircraft.

Flight dynamics of aircraft is an area of mechanics, in which their motion in the air is studied. Two interrelated problems are solved: a direct problem -- trajectory and principle of motion are found for the prescribed forces and moments; and the inverse problem -- the required forces and moments are determined from the prescribed trajectories and principle of motion. The most important problems of flight dynamics consist in determining tactical performance (range of speeds and altitudes, maneuverability, takeoff and landing performance, range and endurance) and flight (trim, stability, and controllability) characteristics. Practical aerodynamics (the applied portion

primarily of aerodynamics and flight dynamics, as well as theory of powerplants and control systems) examines the processes which take place at various phases of flight, knowledge of which is essential to the pilot for conscious mastery of the technique of flying an airplane or helicopter and mastering their combat maneuvering.

From what sources can a pilot or other aviation specialist obtain the knowledge he needs? First and foremost textbooks serve as such sources.

Several years ago scientists at the Military Air Engineering Academy imeni N. Ye. Zhukovskiy were assigned the task of developing basic textbooks on aerodynamics for pilots of line units and pilot cadets at flight schools, which would help aviators master and maintain a level of knowledge corresponding to today's demands. A specially formed Air Forces methods commission on aerodynamics of flight, the members of which included leading specialists at the Military Air Engineering Academy imeni N. Ye. Zhukovskiy, the Military Air Academy imeni Yu. A. Gagarin, military aviation schools, and veteran test pilots, formed teams of authors. They were headed by prominent experts in the field of aerodynamics with experience in preparing textbooks.

The author teams and the commission continuously monitored work on manuscripts. The scientific and methodological thrust of the materials being prepared was carefully corrected and adjusted. The commission members were of the unanimous opinion that each of the basic textbooks should bring together materials possessing scientific and methodological unity, uniformity, and applying to a group of aircraft which are close in performance characteristics. Thus was born the idea of creating a textbook on helicopters and three textbooks on fixed-wing aircraft. From the standpoint of the specific features of aerodynamics and flight dynamics, it is methodologically correct separately to study highly-maneuverable, little-maneuverable, and transport aircraft (with turboprop and turbofan engines -- TVD and DTRD). The Air Forces command authorities gave approval of the idea, and it began to be carried out.

Publication of the basic textbooks is now complete. The following titles have been published: "Aerodinamika i dinamika poleta transportnykh samoletov s DTRD i TVD" [Aerodynamics and Flight Dynamics of Turbofan and Turboprop Transport Aircraft] (V. V. Filippov, editor, Moscow, Voyenizdat, 1981, 416 pages); "Aerodinamika i dinamika poleta vertoletov" [Aerodynamics and Flight Dynamics of Helicopters] (V. F. Romasevich, editor, Moscow, Voyenizdat, 1982, 488 pages); "Aerodinamika i dinamika poleta nemanevrennykh samoletov" [Aerodynamics and Flight Dynamics of Little-Maneuverable Fixed-Wing Aircraft] (V. G. Braga, editor, Moscow, Voyenizdat, 1983, 400 pages); "Aerodinamika i dinamika poleta manevrennykh samoletov" [Aerodynamics and Flight Dynamics of Highly-Maneuverable FIxed-Wing Aircraft] (N. M. Lysenko, editor, Moscow, Voyenizdat, 1984, 544 pages).

These textbooks have been published in the required number of copies and have been distributed among Air Forces flight schools and line units. Every pilot cadet and pilot now has at his disposal a desktop-companion reference guide which contains answers to basic questions dealing with aerodynamics and flight dynamics applicable to a specific type of aircraft. The selected materials

are presented in an easily-understood form. Nevertheless, however, some recommendations must be given on working with these textbooks, especially to aviation school pilot cadets.

Each textbook contains a system of so-called basic information. This information forms the basis for mastering the technique of flying the corresponding aircraft, independent of their specific data. Without possessing basic knowledge it is impossible to master modern aircraft equipment, to understand the principles and mechanisms on which it is based, and clearly to grasp that which is generally called "physics of phenomena."

Basic information in the field of aerodynamics includes data on the basic principles and equations of aerodynamics, including properties of the atmosphere, on the specific features of subsonic, transonic, and supersonic flows of gases, on shock waves, boundary layer, and aerodynamic heating; data on the general properties of aerodynamic forces, moments and lift-drag ratio of aircraft and their relationship to conditions of flight, angles of attack, slip, and Mach numbers; an understanding of the forces and moments involved in stall of wings and aircraft as a whole, on methods of affecting stall, as well as an understanding of aerodynamic layouts of airplanes and helicopters and their specific features, and the function of their principal parts; information on aerodynamic interference and the influence of structural elasticity (wing and fuselage deformations during flight) on aerodynamics.

Flight dynamics contains the following basic information: an understanding of the forces and moments affecting an aircraft's stability and controllability; basic equations of aircraft motion in various phases of flight, an understanding of trim, stability and controllability in longitudinal and lateral motions; airspeed and altitude operating ranges; an understanding of the physical substance of imposed restrictions; performance characteristics of fixed-wing and rotary-wing aircraft; data on takeoff and landing, level flight, range and endurance, climb and descent, maneuvering, as well as on critical and special flight conditions (stall, spin, incipient accidental spin, autorotation, and vortex ring).

Basic information on practical aerodynamics, in addition to that listed above, includes data on the specific features of powerplants, their inlet and outlet devices; high-speed and throttle characteristics of engines, their operating limitations; information on special cases and conditions, as well as data on control systems, distribution of functions between pilot and automatic devices, forming of forces on controls, and specific features of controlling aircraft with equipment malfunctions.

And, finally, there is a group of items which are also basic in practical aerodynamics: these are the general principles and specific features of flying a fixed-wing and rotary-wing aircraft in rough air and in special conditions.

Aircraft technology is evolving at a rapid pace. Fundamentally new kinds of composite materials are being developed, which expand the capability to obtain required aircraft strength characteristics. New types of aircraft layout configurations are becoming feasible, such as, for example, aircraft with

forward-sweep wings. A search is in progress for ways to increase the adaptability of aircraft to changing conditions of flight.

Electronic computers, which are carrying out a revolution in science and technology before our very eyes and are assuming many control functions, have firmly become part of the practical operation of fixed-wing and rotary-wing aircraft. Aerodynamic effects which in the past were not utilized in flight can now, thanks to automatic control, be actively applied in designing aircraft. We know, for example, that a pilot is physically unable to fly an unstable aircraft for an extended time. The flight of such an aircraft can be made stable, however, with the aid of airborne automatic control systems and digital computers. This enables designers to reduce horizontal tail surface and fuselage length, gaining in reduced weight and resistance, and increasing range and endurance. The development of electronic computers represents a revolution both in technology and in science. They provide the capability to study complex phenomena by means of mathematical simulation, about which scientists in the past could not even dream.

In conditions of further development of aviation science and technology it will naturally be necessary continuously to update basic textbooks on aerodynamics. Preliminary calculations indicate that new ones will be needed every 7-8 years. I believe this process will be continuous, and that it should involve the participation not only of teams of authors but also those for whom the textbooks are intended. Therefore provision is being made for collecting and analyzing reader written comments and suggestions, as well as get-togethers between author teams, members of the Air Forces methods council on aerodynamics and flight dynamics, students and faculty members at Air Forces educational institutions, and line-unit pilots. Comments and suggestions by specialists will be of inestimable help in preparing new textbook editions.



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CSO: 9144/565

NON-CURRENT PILOTS ALLOWED TO FLY IN IFR CONDITIONS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) p 33

[Article, published under the heading "Constant Attention to Flight Safety," by Military Pilot 1st Class Gds Col N. Nikulin: "When a Hazardous Flight Situation Has Been Planned"]

[Text] The experience of vanguard aviation subunits attests to the fact that excellent performance results in combat and political training are achieved primarily where military discipline is firm and where political-indoctrination and organizational-methods work to prevent violation of procedures and regulations is being correctly handled. In these collectives flying activities are planned and scheduled in strict conformity with guideline documents, and the rules and procedures of flight operations are unswervingly observed.

But one sometimes encounters facts of a different nature. In some squadrons preconditions for aircraft accidents, one might say, are planned on the ground, long before the commencement of flight operations. How does this happen? Let us examine the most typical cases.

Once Capt Yu. Mishin had a flight scheduled in bad weather. The pilot made a normal takeoff and performed his scheduled maneuvers in the practice area. But he made some bad mistakes on his landing approach, and it was by pure luck that the flight ended without a mishap.

It was ascertained that this officer had never before flown in such conditions, although his logbook contained an entry approving flight in instrument conditions. Mishin had completed the dual-instruction program with considerable time intervals between flights, and he had flown with various instructors. In spite of this fact, Lt Col I. Vyrtsev, after giving the pilot a check ride in VFR conditions, signed approval to fly solo in instrument weather. And regimental deputy commander Lt Col M. Makarov failed to pay attention to this fact when he was examining the flight schedule on the preceding day.

Maj L. Vasilyev also came close to a flying accident. Its cause also lay in unintelligent planning. Officers V. Dubinkin and M. Makarov had given

approval for the pilot to go up, even though his flying skills had grown rusty. A personal lack of discipline by L. Vasilyev also was a factor. While aware that it had been a long time since he had done that type of training, the officer failed to inform his commanding officer that he did not qualify to fly the scheduled training sortie. As a result the pilot was unable to land at his home field and, after several missed approaches, was sent by the flight operations officer to the alternate.

As we see, ignorance by leader personnel of the level of training proficiency of personnel, carelessness in scheduling flight operations, and a diminished sense of responsibility for the assigned task led not only to financial but moral costs as well.

Captain Mishin had to repeat the dual-instruction program under realistic conditions, and Major Vasilyev had to take additional practice flights to regain his flying technique. And this represents unwarranted consumption of fuel and lubricants, plus unwarrantedly logging hours on engines and systems.

Analysis of these and similar incidents indicated that in some subunits leader personnel fail to enlist their deputies, detachment commanders and navigators, and chiefs of services in planning and record keeping on proficiency of flying personnel. Taking on an enormous work volume, they sometimes make mistakes which lead to violation of flight safety. Once, for example, Lt Col Merkushev, analyzing a flight operations schedule prepared by Lt Col V. Dubinkin, ascertained that some of the pilots were past due on taking a check ride to test their ability to fly on backup instruments and to fly a landing approach on one engine. Testing resulted in temporarily grounding a number of pilots.

Deficiencies in planning and scheduling had been pointed out repeatedly to this squadron's leader personnel, but they had failed to reach the proper conclusions. Only after purposeful, specific work by the regimental command, party organization, and methods council did things gradually begin to improve.

Teaching leader personnel correct planning and scheduling of flight operations shifts formed the basis of conducted measures. Emphasis was placed on their personal responsibility for unswerving observance of the requirements of documents governing flight operations. Within a short period of time four out of seven mistakes made by flying personnel were discovered from flight data recorder tapes. This increased the pilots' feeling of responsibility for high-quality performance of flight assignments. Instructors began to have a more serious attitude toward the flight recorder tapes and analysis of tapes between flights.

In discussing smooth-flowing, purposeful aviator combat training, one should not ignore the matter of pilots logging the scheduled standard number of flying hours. To be quite frank, some leader-officers enjoy themselves flying combat aircraft, while others "haul" their subordinates around in two-seaters. Lt Col V. Dubinkin, for example, logged more than double the number of hours scheduled for him. At first glance this would seem to be a gratifying fact but, as was ascertained, he spent 90 percent of his time logged in the air in a combat aircraft and only 10 percent in the instructor's seat. At the same

time Capts Yu. Futyanov and B. Tsybenko, his subordinates, barely exceeded half of the flying hours scheduled for the year.

Why did this happen? It is not difficult to find the answer. Leader-officers Lt Cols M. Makarov and V. Vershinin did not stop the squadron commander in time, did not compel him to think about his men, and did not remind him that the regiment's deputy commanders were being forced to do instructor work in his place. And it is quite logical that V. Dubinkin had poor knowledge of the level of flying proficiency of his pilots. Following his example, the detachment commanders also planned and scheduled their work according to the principle: first myself, and whatever is left over for the others. The proficiency of flying personnel and flight safety suffered as a result. I believe that one can assess this not as a leader's striving toward personal improvement but as failure to perform his job-related duties and a lack of discipline.

Following a detailed analysis of deficiencies, the unit's leader-Communists, party and Komsomol organizations directed their efforts toward correcting them as rapidly as possible and preventing them from reoccurring in the future. Indoctrination work in performance-lagging subunits was revised, and the effectiveness and quality of this work improved appreciably. A series of classes was held with leader-echelon flying personnel to study documents governing flying activities and on methods of planning and scheduling flying hours by types of training and flight operations shifts. Squadron commanders, their deputies, and detachment commanders began preparing graphs indicating level of pilot proficiency, graphically and objectively reflecting their level of training. Flying operations are planned and scheduled in rigorous conformity with the demands of guideline documents.

Of course teaching commanders to plan and schedule intelligently is not a flash-in-the-pan campaign. This process is going on constantly. And although difficulties are encountered, nevertheless, as experience has shown, one can achieve maximum success in minimum time. To achieve this it is necessary to increase personal responsibility for the quality of work performed and to exercise more stringent oversight to ensure that aviators maintain the requisite level of knowledge.



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CSO: 9144/565

MOCK-COMBAT GROUNDCREW REDEPLOYMENT TO ALTERNATE FIELD

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) p 34

[Article, published under the heading "Know-How of the Best Into Aviation Engineer Service Practice," by Capt L. Yakimenko, aviation regiment technical maintenance unit chief: "At the Alternate Airfield"]

[Text] It was just beginning to get light in the east when the signal to assemble sounded in the unit. The men's response had been practiced and rehearsed in advance down to the tiniest detail, and therefore aviation personnel arrived at the field literally within minutes. Soon each subunit was given a mock combat mission.

"The technical maintenance unit," the commanding officer made a brief pause and picked up a pointer, "is to redeploy to its alternate field.... Time to get ready to receive aircraft is limited...."

Aviation personnel gathered up tools and equipment into special carts, without delay, according to precompiled lists. Then the inspection and maintenance group specialists, acting with initiative, loaded the requisite equipment onto trucks. Some time later the column of service vehicles headed out toward the new deployment site. During the march they were suddenly informed that the column was being "attacked" by "aggressor" fighter-bombers. And although all precautionary measures were taken, the umpire -- an officer from higher headquarters -- designated "damage" sustained as a result of the air attack.

It was necessary to halt the column and repair the damage. I must admit that at first there was concern: aviation personnel are not truck mechanics; would they be able to repair service vehicles and get them back on the road? But the concern proved unnecessary. Both officers and men worked as one, with smooth precision. And this is understandable, for each man realized that every minute gained was precious. And who knows: up ahead they might be hit by an "aggressor" airborne assault force, and that would mean additional time needed to accomplish the principal mission.

In short, the aviation personnel worked energetically. When the engine died on one of the trucks, Soviet Army civilian employee V. Guber immediately found

the problem and helped the driver correct it. Soon the engine came to life, and the column headed out once again.

Quite frankly, the route was not easy. But it had been chosen deliberately. It followed remote forest roads, which diminished the probability of "hostile" air attack. And the decision proved to be a good one. Nor did the service vehicle drivers let anybody down. Throughout the entire march they maintained excellent movement discipline and rigorously observed camouflage and concealment measures. The column, undetected, arrived at the other airfield on schedule.

In spite of the fact that a steady drizzle had turned the ground into mud, the aviation specialists of all groups worked swiftly and smoothly setting up shelters, and soon the officer in charge of the forward team reported to the command authorities that they were ready to carry out their mock combat mission.

The powerful roar of aircraft engines reverberated above the airfield. The first bomber was on a landing approach. Routine inspection and servicing procedures would have to be performed on it. The specialist personnel needed no additional instructions -- each one was thoroughly familiar with his duties. Capts K. Chistov and M. Balykov, Sr Lt A. Shuliko and other specialist personnel performed all operations on the aircraft quickly and with excellent quality, in strict conformity with the requirements of servicing and maintenance procedures. And although they had to operate as reduced-strength teams, the inspection and servicing operations were completed with a mark of excellent.

Party and Komsomol activists worked hard during this time. They distributed their manpower in such a manner as to cover all aviation personnel with their influence. They efficiently organized the printing of combat news bulletins and operational news sheets. Soon a photonewspaper also appeared. A good job on putting it out was done by Sr. Lt A. Shuliko, Pvt G. Veytas, and others. Socialist competition standings were continuously displayed on the display boards of the visual agitation kit, set up on the spot.

It was with a good deal of pleasure that our servicemen watched the subsequent takeoff of each bomber they had serviced! Thanks to the conscientiousness of the aviation engineer service specialists and their high degree of professional skill, all inspection and servicing procedures on the aircraft were performed precisely on schedule and with excellent quality.

Observing the actions of my subordinates here at the alternate airfield, I became even more convinced that the conscientious and persistent work performed by the command authorities, party and Komsomol activists on the eve of the exercise had produced positive results. Aviation personnel successfully accomplished the assigned mock combat mission, demonstrating examples of military and process discipline.

Of course a great deal was accomplished by a frank, to-the-point talk about the responsibility of Communists for carrying out their party and professional duty on the eve of the forthcoming exercise and their ability to work fast and

efficiently at another airfield, a talk which was held at a technical maintenance unit party meeting. Party members made a great many businesslike suggestions and displayed persistence and purposefulness in searching for an efficient mode of redeploying to another field.

The party decision pledged party members to show personal exemplariness at all phases of the tactical air exercise. The resolution devoted considerable attention to efficiency innovator work by personnel. It was suggested that the subunit's innovators devise in the future the fabrication of compact test benches, instruments, and other general-purpose devices speeding up preflight preparation of aircraft.

After that meeting Communists played an enhanced role in boosting the effectiveness of technical instruction of junior aviation specialists, in strengthening military and process discipline, and in guiding the activities of the Komsomol organization.

Our innovators also worked fruitfully in the first period of training. Communists, giving an example to their fellow soldiers, incorporated valuable suggestions which made it possible substantially to shorten the time required to make inspection and servicing teams ready for immediate action, as well as to facilitate the job of aircraft maintenance specialists in field conditions. Sr Lt L. Smirnov, for example, devised a mobile version of placement of his group's equipment. Sr Lts A. Shuliko, S. Mikhalev, and P. Dayneko designed two special carts which subsequently made things much easier on the men in performing servicing operations at another airfield.

A great deal was also done by the technical maintenance unit Communists to improve the operations of the Komsomol organization. For example, the members of the party buro repeatedly discussed at their meetings matters pertaining to technical instruction of young specialists, and they subsequently devised measures jointly with Komsomol leader Lt S. Romanenko to accomplish its further improvement, thought out and detailed technical study group class plans taking into account the level of training and specialization of various categories of personnel. The holding of classes on military occupational specialty at least four hours per week for the mechanics of the various groups became mandatory, for example, which considerably broadened their tactical knowledgeability.

In short, a great deal was accomplished to increase the subunit's combat readiness and mobility and to reduce the time required to ready technical maintenance unit personnel to perform servicing operations at another airfield. Painstaking, coordinated work on the part of the command authorities, party and Komsomol organizations created a solid foundation for successful performance by the men of our technical maintenance unit at the tactical air exercise and made it possible to take one more step forward in improving the combat expertise of aviation personnel and in boosting the subunit's combat readiness.

The tactical air exercise also revealed some deficiencies: for example, inadequate march training on the part of the young drivers. Our efficiency innovators must also work on devising a mobile laboratory for the aiming-

navigation system servicing group. It will substantially broaden the range of preventive measures carried out in field conditions.

The summer period of training has begun. Preparing to honor in a worthy manner the 27th CPSU Congress, our collective has made ambitious socialist pledges. To meet these pledges is a matter of honor for each and every military aviator, each and every technical unit specialist. And we are filled with resolve to maintain the lofty title of excellent technical maintenance unit of a regiment which is the initiator of socialist competition in the district's air forces.



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CSO: 9144/565

TOP AIR-FORCE OFFICIALS DISCUSS FOURTH-GENERATION AIRCRAFT MAINTENANCE

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 37-39

[Article, published under the heading "'Round-Table' Get-Together," round-table discussion sponsored by AVIATSIYA I KOSMONAVTIKA: "A High Level of Mastery of New Equipment"]

[Text] The new-generation fixed-wing and rotary-wing aircraft entering service with Air Forces units and subunits are distinguished by a higher thrust-to-weight ratio, improved aerodynamic characteristics, and capability to carry a heavy combat payload. Persistent study, practical assimilation and efficient combat employment of aircraft and aircraft armament, as well as their knowledgeable operation, servicing and maintenance on the ground and in the air are among the priority tasks assigned to the winged defenders of the homeland. This is demanded, as was noted at the April (1985) CPSU Central Committee Plenum, by the complex international situation and the interests of defending our socialist homeland.

Recently the editors of the journal AVIATSIYA I KOSMONAVTIKA held a round-table get-together, at which the participants discussed problems pertaining to mastering new equipment. Our guests included Maj Gen Avn Gennadiy Nikolayevich Matveyev, chief of the Aircraft Maintenance Directorate and deputy chief engineer of the Air Forces; Maj Gen Anatoliy Petrovich Antonov, deputy chief of the Aircraft Major Overhaul Directorate; as well as officer-specialists Cols Yuriy Viktorovich Golokhvastov, Valeriy Anatolyevich Verzilov, and Anatoliy Nikolayevich Grebnev. The participants discussed in detail current issues connected with servicing and maintenance of fourth-generation fixed-wing and rotary-wing aircraft.

The following is an abridged text of the discussion.

(Maj Gen Avn G. MATVEYEV): The tasks connected with mastering and assimilation of fourth-generation fixed-wing and rotary-wing aircraft and adoption of the most efficient modes of their combat employment demand of Air Forces engineer

and technician personnel a constant, persistent search for ways to improve the quality of all operations performed on aircraft equipment. First and foremost it is essential to raise to a higher degree the level of scientific and technical knowledge and professional skills of aviation engineer service specialists of all categories, their technical knowledgeability and discipline, and their ability to troubleshoot knowledgeably and on a rigorously scientific basis, to predict and prevent malfunctions by the method of detailed analysis.

The new equipment also demands a new approach to moral-political and psychological training of aviation engineer service officers. At the present stage of development of military aviation it is inconceivable to achieve a high level of technical sophistication and process discipline without specific moral-practical and psychological qualities, firm military discipline, and an innovative attitude by all aviation engineer service specialists toward improving their professional competence.

Let us picture a situation: a fresh graduate of a higher aviation engineering school has reported for duty to a regiment in which highly complex combat systems are in service. He was hoping to be assigned to an engineer supervisory position, but he was assigned as an aircraft engineer. Suddenly it is discovered that the officer is inadequately prepared for this psychologically. He is taken over by a feeling of injured pride. This cannot be ignored. It is essential to work day by day, developing in each and every aviation engineer service specialist a conviction about the need for conscientious labor in his assigned job and an endeavor to work constantly to improve his professional expertise.

Quite naturally the process of development of aviation engineer service officers is not completed either at a service academy or service school. Practical experience incontrovertibly attests to the fact that serious and thorough "adding of finishing touches" in a line assignment is necessary.

Precisely at this stage it is easier, and also more necessary, to go through a process of determining job aptitude on the basis of moral-political and professional qualities and the ability to think intelligently and analytically. Subsequently, taking all this into account, one can distribute youth manpower and professional talent among the various areas of present-generation fixed-wing and rotary-wing aircraft maintenance. An important role in this is played by commanders, political workers, party and Komsomol activists, and experienced subunit officers.

Nevertheless the aviation engineer service commander -- the squadron commander's main support in organization of high-quality study, assimilation, and subsequently servicing and maintenance of modern aircraft equipment by subunit personnel -- is called upon to exert the greatest influence on the development of young aviation engineer service specialists. Training of young engineer and technician cadres and their "final adjustment" to the requisite professional level also depends in large measure on his organizer abilities and pedagogic talent.

In this connection I believe that certain benefit will be derived by the practical discussion on the pages of this journal of an article by Maj Gen Avn A. Grishin entitled "Squadron Engineer, What Should He Be?" published in issue No 11, 1984. I myself am closely watching it and should note that the readers are presenting rather interesting ideas connected with the difficult duties of the squadron deputy commander for aviation engineer service. Implementation of these ideas will unquestionably help local commanders reach a more correct orientation in selection and indoctrination of supervisory-echelon engineer cadres.

And finally, the following. Today proper attention is being devoted to efficiency innovation work aimed at developing highly-mobile equipment designed for performing routine inspection, servicing and repair operations on aircraft in field conditions. The units have done a great many new and interesting things in this regard. It is important extensively to publicize vanguard modes and methods of field repair and securement of march preparation of aviation engineer service personnel and equipment. I would consider it essential that primarily aviation engineer service supervisors be initiators in this work -- from chief of flight and group technical maintenance unit to unit area of specialization engineer. This would be one of the criteria for evaluating their activities in matters of effective mastery and assimilation of new aircraft.

(Lt Col YU. GOLOKHVASTOV): I would like to say that one can clearly see two aspects to the matter of improving the reliability of long-range missile-armed combat aircraft and flight safety with these aircraft: high-quality mastery and assimilation of modern aircraft by aviation engineer service personnel and further detailed study of new instruments, systems and equipment added to older-model combat aircraft in the process of upgrading them. It is very important for aviation engineer service specialists to be knowledgeable on the interaction of component parts of a system, which ensures high-quality analysis of malfunctions, their correction and, in the final analysis, full utilization of an aircraft's combat capabilities. Painstaking work is being done in the units toward this end. Nevertheless there is a need to intensify it, to devote more attention to study and carry out special instructions by the chief engineer of the Air Forces on organization of operation-by-operation monitoring and inspection. As practical experience indicates, this type of monitoring and inspection is not yet in conformity with present-day requirements of guideline documents which govern mishap-free flight operations.

There have been many instances where aviation engineer service specialists, utilizing it in the course of readying aircraft for a training sortie, have promptly detected malfunctions and have prevented a mishap-threatening situation. Their experience merits careful study and extensive dissemination. Much instructive knowledge has been amassed in the process of correcting malfunctions in flight. Many flight technicians, flight engineers, and senior flight technicians merit their experience and know-how being made available to others. Experience in organizing good training facilities, technical training classrooms, working display stands and simulators by the squadrons and technical maintenance units should be studied and disseminated.

And now a few words about the role of subunit aviation engineer service supervisor personnel within the system of organizing servicing and maintenance of today's aircraft. As Maj Gen Avn A. Grishin correctly emphasized in his article "Squadron Engineer, What Should He Be?", one should not underrate the role and significance of the squadron deputy commander for aviation engineer service as that person in authority who is directly responsible for maintenance and repair of aircraft equipment and keeping it in a continuous state of combat readiness. I should like to note in particular that the dialogue on this subject which has been extensively conducted on the pages of the journal AVIATSIYA I KOSMONAVTIKA is unquestionably useful and relevant.

A great deal of positive results have been amassed in work by this category of officer-leaders in the aviation regiment which initiated socialist competition in the Air Forces under the slogan "Our Selfless Military Labor in Honor of the 40th Anniversary of the Great October Revolution and the 27th CPSU Congress!" It is our party duty and professional obligation to adopt these vanguard achievements in a practical manner.

(Col V. VERZILOV): Shortening the time required to prepare aircraft armament for training sorties is a matter which is presently being seriously addressed by aviation commanders and service chiefs. The fact is that labor expenditures have increased greatly with an increase in the combat payload per aircraft and increasing complexity of process operations involved in readying the armament of fixed-wing and rotary-wing aircraft for combat utilization. These labor outlays include delivering munitions to the flight line, off-loading them, preparation for use and, finally, mounting ordnance or loading weapons.

How can labor expenditures be reduced? Increasing the size of the weapons servicing and preparation groups is not the best way. Efficient solution to the problem lies elsewhere -- in boosting the level of scientific and technical knowledge as well as the professional skills of aviation engineer service specialists, their level of technical sophistication and discipline. It is possible on this basis to intensify military labor through extensive incorporation of various means of mechanization and automation into the process of preparing and readying armament.

A broad area of activity opens up here for efficiency innovators and inventors. By giving them daily, effective assistance in engaging in this work, unit and subunit deputy commanders for aviation engineer service, party and Komsomol organizations are actively helping boost the combat readiness and fighting efficiency of military collectives and are making a substantial contribution toward strengthening the defense capability of the homeland.

(Col A. GREBNEV): Practical experience indicates that a high degree of organization of work performed on aircraft equipment, discipline and expertise on the part of aviation engineer service officers and all aviation engineer service specialists form the basis of high-quality accomplishment of all combat training tasks.

The better people grasp just what technical competence is, the greater the success will be. It means first and foremost rigorous observance of all

prescribed conditions of aircraft equipment operation, servicing, maintenance and repair. Technical competence presupposes conscientiously precise observance of standard rules and regulations which have been elaborated over many years of practical experience. Ground specialists ready a modern aircraft in a precise sequence, following a process schedule, utilizing specialized chart diagrams and test equipment. It is precisely the high level of technical competence of today's aviation engineer service specialist which constitutes a measure of all his activities in the process of servicing and maintaining new aircraft.

(Maj Gen Avn A. ANTONOV): The workers at aircraft repair and overhaul enterprises today perform a complex aggregate of tasks: they restore aircraft to proper operating condition, learn to repair and overhaul new fixed-wing and rotary-wing aircraft, and concern themselves with improving work efficiency and quality in all process components. They campaign to achieve thrift and economy, and they work persistently to adopt the know-how of vanguard workforces and the top specialists. The decisions of the April (1985) CPSU Central Committee Plenum have become a guide to action for aircraft repair and overhaul workers.

Air Forces aircraft repair and overhaul enterprises have undergone appreciable changes in recent years. Their production capabilities have increased, as has the range of tasks they perform. More than half of the workforces completed pledges honoring the 40th anniversary of the great Victory ahead of schedule and with excellent technical-economic production indices, and they are achieving additional success in socialist competition to honor the 27th CPSU Congress in a worthy manner. They include the workforces headed by officers Rybin, Koshovnik, Kostyuchenko, and others.

The forms of socialist competition conducted here are diversified. They include the movement for a communist attitude toward labor and a campaign for excellent production indices on the basis of bilateral contractual agreements, as well as for ahead-of-schedule accomplishment of individual and brigade plan targets. At the present time, when many workforces have proceeded to learn to repair and overhaul fourth-generation airplanes, helicopters, and engines, competition to earn the honorary title "Best Brigade (Section)," "Best in Job Category," "Excellent Quality Performer," "Best Young Worker," and others is in full swing.

A great deal is being done to achieve further improvement in brigade forms of organization of labor and labor remuneration, to develop among workers competition on the basis of individual or brigade production targets, and among engineer-technician personnel and civilian employees -- on the basis of personal achievement targets. Presently about 60 percent of brigades figure in a labor participation factor in paying for performed work. This advanced form of organization of labor and labor remuneration is experiencing increasingly strong development.

Pursuant to the requirements prescribed in an order issued by the USSR minister of defense, at the present time Air Forces aircraft repair and overhaul enterprises are planning out long-term measures connectedwith the process of further modernization of aircraft equipment and organization of its

high-quality repair and overhaul, and are drawing up comprehensive schedules aimed at achieving a substantial reduction of manual labor in production. Appropriate commissions are being formed, and a list of job categories in which mechanization is a priority need is being determined.

The most complex and critical tasks will be facing Air Forces repair and overhaul workers in the 12th Five-Year Plan. They will be continuing to master new kinds of repair and overhaul on airframes and powerplants. For this reason serious attention will also be devoted to further increasing efficiency of production, improving work quality in all areas, achieving all-out observance of an economy regimen, process, labor, and financial discipline.



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CSO: 9144/565

READERS COMMENT ON QUALITIES OF SQUADRON ENGINEER

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 39-40

[Article, published under the heading "The Reader Continues the Discussion," by Lt Col V. Basok: "Methods Specialist and Indoctrinator"]

[Text] The editors are continuing to receive responses to Maj Gen Avn A. Grishin's article entitled "Squadron Engineer. What Should He Be?" (AVIATSIYA I KOSMONAVTIKA, No 11, 1984). The topic raised in the article has stirred the emotions of aviation readers and has aroused them to engage in a frank, concerned discussion on the role and place of the squadron deputy commander for aviation engineer service within the system of training and indoctrination of military personnel and on the moral-political and professional qualities and traits which he should possess. We publish below one of the responses, which discusses the experience in indoctrination work with aviation personnel acquired by squadron deputy commander for aviation engineer service officer P. Borodatov.

The aviation regiment's deputy commander for political affairs, Gds Lt Col S. Mishunin, seemed to have prepared a reply in advance.

"The squadron's best engineer? That would of course be Gds Maj Petr Ivanovich Borodatov," he said. "A man of the purest heart and soul. A principled Communist and good commander. He knows how to communicate with any and all aviation personnel, and people appreciate this. No mishap-threatening situations occur in the squadron through the fault of the ground maintenance specialists, and the quality of preparation of aircraft for flight operations is always excellent. In short, Petr Ivanovich is both a top methods specialist and indoctrinator."

"Methods specialist and indoctrinator...." These words spoken about the engineer by the political worker caused me to give some thought to the role in the squadron collective played by the subunit deputy commander for aviation engineer service. Today he is not simply an engineer, as he had been called in the past, considering his relationship to aircraft equipment. Today he must in addition be an "engineer of men's souls," since operation and

maintenance of today's aircraft systems is inconceivable without developing in the men who ready them for flight the finest moral-psychological qualities and a sense of personal responsibility for every operation performed on the aircraft.

There is no question that the squadron engineer is obliged first and foremost to possess consummate knowledge of the equipment being operated and maintained, since he is responsible for ensuring that it is continuously in good working order and flight-ready. At the same time he also bears responsibility for the indoctrination, training, and military discipline of the personnel of the aviation engineer service he heads. The condition of aircraft, failure-free flying and, in the final analysis, the subunit's combat readiness depend to a decisive degree on the professional competence of the technicians and mechanics, their attitude toward their job, their discipline and efficiency. Party member Borodatov realizes this perhaps more than others of his colleagues. Herein evidently lies the guarantee of the success of aviation engineer service personnel, particularly this collective, and at the same time the high degree of respect enjoyed by Gds Maj P. Borodatov.

This officer's labor is being repaid with interest. At the present time the majority of technicians and mechanics in the subunit are highly-skilled specialists, genuine experts at their jobs. Gds Sr Lts V. Volodkin, A. Boldyrev, and Yu. Kirilovskiy, and Gds WOs A. Mynzat and A. Kiriyan are known in the regiment as exceptionally conscientious aviation personnel who are dedicated to their profession.

Working alongside them in the collective, however, are those who at present need additional monitoring and effective assistance.

...From young officer A. Aleksandrov's very first days in the squadron, things did not go smoothly for him. Disciplinary infractions and a negligent attitude toward aircraft maintenance undermined respect for the lieutenant. They began referring to him as a lagging, remiss individual. Petr Ivanovich believed, however, that ultimately Aleksandrov would take his rightful place alongside the others, and therefore he proceeded to do individual indoctrination work with him, which sometimes required considerable time and effort. What forms and methods did the squadron engineer employ? Borodatov did not have any special secrets. As a rule he employed lengthy individual talks and a serious comradely discussion at meetings, technical analysis sections, and during brief drills. Finally the time came when Aleksandrov began to show a different attitude toward his job. He became more composed and serious. This had a positive effect of his job performance.

Guards Major Borodatov is one of those who "dig" as deep as possible in indoctrination with their subordinates, seeking to ensure that the threads of interrelationships between people are always pulled in sync, so that he as a leader could sense that the contacts were "closed." But how does one achieve such a situation? A squadron deputy commander for aviation engineer service has considerable authority. One of course can use the force of orders to compel a subordinate to do what must be done. But party member Borodatov believes that it can be handled differently as well.

Inspecting the aircraft of Gds Lt A. Vorobyev, Petr Ivanovich, as always, was at the same time talking to the young officer about the operation of the principal instruments, systems and equipment and the latter's knowledge of his job duties. During the inspection he asked: "Tell me, comrade guards lieutenant, how the landing gear brake release system operates."

Suddenly the technician found himself unable to answer what seemed to be a simple question. Instead of giving him a dressing down, Petr Ivanovich said to his subordinate: "Work on this topic, make some outline notes, and show them to me. Understood?"

"Yessir, comrade guards major," replied Vorobyev.

At the designated time the aircraft technician presented his notes to the squadron engineer, took and passed a tough test on this topic.

Guards Major Borodatov displays an example of pedagogic skill and tact to the chiefs of the flight technical maintenance units, servicing groups, and other officers in his work with aviation personnel. As his colleagues say about him, Petr Ivanovich seems to have a second set of eyes, which enable him to see and precisely to sense even the slightest changes in people's character and in their attitude toward performance of military duty, to see and skillfully to guide the indoctrination process.

For example, things began to go much better for Guards Lieutenant Vorobyev in mastering the equipment, and quality of aircraft servicing and maintenance improved. But Borodatov sensed that the young officer did not yet possess a good-management sense or concern about ensuring that not only the aircraft but his work station as well be in excellent condition. But there was a model right next to him. Gds Lt A. Shestakov, who handled the neighboring combat aircraft, was distinguished by exceptional conscientiousness in his work. The squadron deputy commander for aviation engineer service had cited him time and again as an example to the other young technicians. And he decided to utilize this positive experience and know-how for indoctrination purposes. In place of exhortations, he suggested that Vorob'yev walk over to Shestakov's aircraft and see how the latter maintained his work station. Results were soon in evidence.

Training and indoctrination is a complex, formidable process, in which there are no ready formulas covering all situations in life. Borodatov has become convinced through his own personal experience that the more closely this process is linked to the subunit's affairs, to aviator personnel socialist competition, and to their achievement of pledges, the more successful it is. And this in turn compels party member Borodatov to be constantly searching, struggling for the development of young characters, for improvement in the moral-ethical and professional qualities of his subordinates, which in the final analysis affects the squadron's combat readiness.

I believe that a powerful demand of the time also consists in this. The author of the article "Squadron Engineer. What Should He Be?" correctly emphasizes that today such qualities as organizing ability, initiative and businesslike efficiency, and the ability to adjust the components of aviation

engineer service in such a manner that all are equally strong, reliably providing high-quality, orderly training of aviation personnel and continuous squadron combat readiness are being advanced to the forefront with this category of leader-Communists.



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CSO: 9144/565

SOVIET SPACE LAUNCHES IN 1984

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 42-43

[Tabular listing: "Table of Launchings of Space Vehicles in the USSR in 1984"]

[Text] Table of Launchings of Space Vehicles in the USSR in 1984

| a Дата запуска | Название аппарата | Начальный период обращения, мин | 7 Высота орбиты | | Наклонение орбиты, град. |
|---|---|---|---|---|---|
| | | | в апогее, км | в перигее, км | |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 5 января | b «Космос-1522» — «Космос-1529» | 115 | 1510 | 1449 | 74 |
| 11 января | «Космос-1530» | 90,1 | 391 | 206 | 72,8 |
| 11 января | «Космос-1531» | 105 | 1023 | 994 | 82,9 |
| 13 января | «Космос-1532» | 89,8 | 382 | 178 | 67,2 |
| 26 января | «Космос-1533» | 90,4 | 382 | 235 | 70,4 |
| 26 января | «Космос-1534» | 94,5 | 519 | 470 | 65,8 |
| 2 февраля | c «Космос-1535» | 105 | 1029 | 974 | 83 |
| 8 февраля | d «Союз Т-10» | 89,4 | 274 | 226 | 51,6 |
| 8 февраля | «Космос-1536» | 97,8 | 679 | 648 | 82,5 |
| 15 февраля | e «Радуга» | e 24 ч | e круговая 35 950 | | 1,3 |
| 16 февраля | «Космос-1537» | 89,5 | 317 | 220 | 82,4 |
| 21 февраля | f «Прогресс-19» | 88,7 | 261 | 192 | 51,6 |
| 21 февраля | «Космос-1538» | 100,8 | 820 | 781 | 74 |
| 28 февраля | «Космос-1539» | 89,6 | 367 | 179 | 67,1 |
| 2 марта | g «Космос-1540» | 24 ч 5 мин | круговая 36 000 | | 1,4 |
| 6 марта | «Космос-1541» | 11 ч 50 мин | 39 424 | 584 | 62,9 |
| 7 марта | «Космос-1542» | 90,3 | 373 | 236 | 70,4 |
| 10 марта | «Космос-1543» | 90,6 | 416 | 224 | 62,8 |
| 15 марта | «Космос-1544» | 97,8 | 677 | 649 | 82,5 |
| 16 марта | h «Экран» | 23 ч 43 мин | круговая 35 530 | | 0,1 |
| 17 марта | i «Молния-1» | 12 ч 15 мин | 40 579 | 646 | 62,9 |
| 21 марта | «Космос-1545» | 90,2 | 396 | 208 | 72,9 |
| 29 марта | «Космос-1546» | 24 ч 8 мин | круговая 36 029 | | 1°19' |

Vehicle Designation

Kosmos -- designation of a series of artificial Earth satellites launched in the Soviet Union on a regular basis (beginning on 16 March 1962) by various boosters from several launch facilities, tasked with investigating space and the upper atmosphere. The scientific program prescribes study of concentration of charged particles, corpuscular fluxes, radio wave propagation, the Earth's radiation belt, solar radiation, meteoric matter, cloud systems in the Earth's atmosphere, as well as development of many space vehicle components.

Kosmos 1522 - Kosmos 1529 -- satellites launched into orbit by a single booster.

Soyuz T-10 -- a manned mission, with mission commander Hero of the Soviet Union Pilot-Cosmonaut USSR Col L. Kizim, flight engineer V. Solovyev, and cosmonaut-scientist O. Atkov. The craft docked with the Salyut 7 orbital station on 9 February. On 13 April the cosmonauts undocked the

(Table on preceding page, cont'd)

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| 3 апреля j | «Союз Т-11» | 89,4 | 275 | 222 | 51,6 |
| 4 апреля | «Космос-1547» | 11 ч 49 мин | 39 340 | 615 | 62,8 |
| 10 апреля | «Космос-1548» | 89,5 | 359 | 177 | 67,1 |
| 15 апреля | «Прогресс-20» | 88,9 | 277 | 192 | 51,6 |
| 19 апреля | «Космос-1549» | 90,2 | 394 | 208 | 72,9 |
| 22 апреля k | «Горизонт» | 24 ч 23 мин | круговая 36 320 | | 11,4 |
| 8 мая l | «Прогресс-21» | 88,7 | 264 | 193 | 51,6 |
| 11 мая | «Космос-1550» | 105 | 1025 | 993 | 83 |
| 11 мая | «Космос-1551» | 89,3 | 305 | 209 | 72,9 |
| 14 мая | «Космос-1552» | 89,6 | 344 | 191 | 64,9 |
| 17 мая | «Космос-1553» | 104,8 | 1020 | 977 | 82,9 |
| 19 мая | «Космос-1554»—«Космос-1556» | 11 ч 16 мин | круговая 19 125 | | 64,8 |
| 22 мая | «Космос-1557» | 89,2 | 276 | 221 | 82,3 |
| 25 мая | «Космос-1558» | 89,1 | 318 | 178 | 67,2 |
| 28 мая | «Прогресс-22» | 88,8 | 261 | 194 | 51,6 |
| 29 мая | «Космос-1559»—«Космос-1566» | 115 | 1512 | 1444 | 74 |
| 30 мая | «Космос-1567» | 93,3 | 462 | 428 | 65 |
| 1 июня m | «Космос-1568» | 90,2 | 396 | 209 | 72,8 |
| 6 июня | «Космос-1569» | 11 ч 50 мин | 40 165 | 614 | 62,8 |
| 8 июня | «Космос-1570» | 100,9 | 830 | 792 | 74 |
| 11 июня | «Космос-1571» | 90,4 | 398 | 218 | 70 |
| 15 июня | «Космос-1572» | 89,4 | 297 | 227 | 82,4 |
| 19 июня | «Космос-1573» | 89,4 | 317 | 209 | 72,9 |
| 21 июня | «Космос-1574» | 105 | 1021 | 985 | 83 |
| 22 июня | «Радуга» | 23 ч 17 мин | круговая 35 100 | | 1,3 |
| 22 июня | «Космос-1575» | 89,4 | 292 | 231 | 82,3 |
| 26 июня | «Космос-1576» | 89,7 | 376 | 180 | 67,1 |
| 27 июня | «Космос-1577» | 104,9 | 1023 | 974 | 83 |
| 28 июня | «Космос-1578» | 105 | 1673 | 296 | 50,7 |
| 29 июня | «Космос-1579» | 89,6 | 281 | 257 | 65 |
| 29 июня | «Космос-1580» | 90,4 | 367 | 249 | 62,8 |
| 4 июля n | «Космос-1581» | 11 ч 50 мин | 40 165 | 614 | 62,8 |
| 5 июля | o «Метеор-2» | 104 | 974 | 954 | 82,5 |
| 17 июля | «Союз Т-12» | 90,2 | 309 | 282 | 51,6 |
| 19 июля | «Космос-1582» | 89,5 | 308 | 227 | 82,4 |
| 24 июля | «Космос-1583» | 90,1 | 388 | 209 | 72,9 |
| 27 июля | «Космос-1584» | 88,8 | 268 | 193 | 82,4 |
| 31 июля | «Космос-1585» | 89,3 | 324 | 181 | 64,8 |
| 2 августа p | «Космос-1586» | 11 ч 50 мин | 40 165 | 614 | 62,8 |
| 2 августа | «Горизонт» | 23 ч 55 мин | круговая 35 785 | | 1,5 |
| 6 августа | «Космос-1587» | 90,2 | 394 | 209 | 72,9 |
| 8 августа | «Космос-1588» | 93,3 | 457 | 438 | 65 |
| 8 августа | «Космос-1589» | 116 | 1523 | 1500 | 82,6 |

craft from the equipment module to the station transfer module. L. Kizim and V. Solovyev set a record for manned missions, making six EVAs of a total duration of 22 hours 50 minutes, performing complicated installation operations. The cosmonauts returned to Earth on board the Soyuz T-11 on 2 October. During the 237-day mission they performed 500 scientific-technical and medical-biological studies and experiments.

Raduga -- communications satellite with onboard relay gear for providing telephone-telegraph radio communications and transmission of TV programming. In contrast to Molniya, the Raduga satellite is lifted not into a high elliptical orbit but into a geostationary orbit, that is, it has a constant position relative to the Earth's surface. The satellite carries multiunit communications gear operating in the centimeter band, as well as the requisite array of supporting systems.

Progress 19 is an unmanned supply craft. Purpose of launch: to deliver consumables and various other supplies to the orbital station. Automatic docking of this craft with the Salyut 7 - Soyuz T-10 orbital complex took place on 23 February. The craft separated from the orbital complex on 31 March. The mission terminated on 2 April.

Ekran -- a TV broadcast satellite with onboard relay equipment, providing decimeter-band transmission of USSR Central Television programming to a network of community use receiving facilities. It is the first and to date the world's only permanently-operating direct TV broadcasting system. Further extension of its

(Table on preceding page, cont'd)

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| 10 августа | «Молния-1» | 12 ч 15 мин | 40 772 | 479 | 62,7 |
| 14 августа | «Прогресс-23» | 88,8 | 267 | 194 | 51,6 |
| 16 августа | «Космос-1590» | 89,3 | 293 | 221 | 82,4 |
| 24 августа | «Экран» | 23 ч 45 мин | круговая 35 580 | | 0,4 |
| 24 августа | «Молния-1» | 12 ч 17 мин | 40 877 | 467 | 62,8 |
| 30 августа | «Космос-1591» | 89,4 | 300 | 220 | 82,3 |
| 4 сентября q | «Космос-1592» | 90 | 380 | 209 | 72,9 |
| 4 сентября | «Космос-1593»—«Космос-1595» | 11 ч 16 мин | круговая 19 141 | | 64,7 |
| 7 сентября | «Космос-1596» | 11 ч 49 мин | 39 342 | 613 | 62,8 |
| 13 сентября | «Космос-1597» | 89,1 | 272 | 219 | 82,3 |
| 13 сентября | «Космос-1598» | 105,2 | 1029 | 987 | 83 |
| 25 сентября | «Космос-1599» | 88,7 | 275 | 179 | 67,2 |
| 27 сентября | «Космос-1600» | 90,4 | 404 | 215 | 70 |
| 27 сентября | «Космос-1601» | 94,5 | 521 | 477 | 65,8 |
| 28 сентября | «Космос-1602» | 97,8 | 680 | 648 | 82,5 |
| 28 сентября | «Космос-1603» | 102,2 | 877 | 852 | 71,2 |
| 4 октября r | «Космос-1604» | 11 ч 49 мин | 39 342 | 613 | 62,8 |
| 11 октября | «Космос-1605» | 104,9 | 1031 | 969 | 82,9 |
| 18 октября | «Космос-1606» | 97,7 | 678 | 649 | 82,5 |
| 31 октября | «Космос-1607» | 89,6 | 280 | 256 | 65 |
| 14 ноября s | «Космос-1608» | 89 | 275 | 205 | 70 |
| 14 ноября | «Космос-1609» | 90 | 385 | 208 | 73 |
| 15 ноября | «Космос-1610» | 105 | 1027 | 987 | 83 |
| 21 ноября | «Космос-1611» | 89,3 | 326 | 181 | 64,8 |
| 27 ноября | «Космос-1612» | 98,1 | 1231 | 130 | 82,6 |
| 29 ноября | «Космос-1613» | 90 | 382 | 209 | 72,8 |
| 14 декабря t | «Молния-1» | 12 ч 17 мин | 40 900 | 461 | 62,8 |
| 15 декабря | u «Вега-1» | | | | |
| 19 декабря | «Космос-1614» | | | | |
| 20 декабря | «Космос-1615» | 93,9 | 501 | 437 | 65,9 |
| 21 декабря | «Вега-2» | | | | |

coverage area is impossible, however, due to the interference it could cause. Therefore the Moskva distribution system was additionally established, which operates via a powerful Gorizont repeater satellite in the centimeter band. The Ekran and Moskva systems open up prospects of providing full nationwide coverage with Central Television broadcasting.

Molniya 1 -- a communications satellite to support long-distance telephone and telegraph radio communications, as well as transmission of USSR Central Television programming to Orbita network facilities. It is in a highly-elongated elliptical orbit with an approximately 40,000 km apogee (perigee above the Southern Hemisphere). This orbit provides communications sessions running up to 8-10 hours in the Northern Hemisphere. The first satellite, Molniya 1, was launched on 23 April 1965. Its subsequent upgrading led to the development of the Molniya 2 and Molniya 3 satellites. In particular, they employ a higher frequency band (4-6 GHz), which makes it possible to increase severalfold the number of telephone-telegraph communications channels. This also made it possible to improve TV picture quality.

Soyuz T-11 spacecraft. International crew: mission commander Hero of the Soviet Union Pilot-Cosmonaut USSR Col Yu. Malyshev, flight engineer Hero of the Soviet Union Pilot-Cosmonaut USSR G. Strekalov, and cosmonaut-scientist R. Sharma, citizen of the Republic of India. On 4 April the spacecraft docked with the Salyut 7 - Soyuz T-10 orbital complex, manned by a crew consisting of L. Kizim, V. Solovyev, and A. Atkov. The cosmonauts returned to Earth on board the Soyuz T-10 spacecraft on 11 April, after completing the program of joint work activities with the primary crew.

Progress 20 -- unmanned supply craft. Purpose of launch: to deliver expendable and various other supplies to the orbital station. On 17 April

1984 the craft automatically docked with the Salyut 7 - Soyuz T-11 orbital complex. The mission was completed on 7 May.

Progress 21 -- an unmanned supply craft. Purpose of launch the same. On 10 May 1984 the craft made an automatic docking with the manned orbital complex. The craft was undocked on 26 May, its mission completed.

Gorizont -- a communications satellite. Launched as part of a program of further development of communications and television broadcasting systems utilizing artificial Earth satellites. Boosted into a geostationary orbit at a "station" at 53 degrees east longitude, it was assigned international identifying registration index number Statsionar-5.

Kosmos 1554 - Kosmos 1556 satellites, lifted into orbit by a single booster.

Kosmos 1559 - Kosmos 1566 satellites, lifted into orbit by a single booster.

Progress 22 -- unmanned supply craft. Launched for the purpose of delivering consumables and various other supplies to the orbital station. On 30 May 1984 the craft accomplished an unassisted docking with the orbital complex. On 15 July 1984 the craft was undocked, and its mission was ended on 16 July.

Raduga -- communications satellite with onboard relay equipment, designed to provide telephone-telegraph radio communications and transmission of TV programming. Lifted into a stationary orbit, with "station" at 128 degrees east longitude, it was assigned the international identifying registration index number Statsionar-15.

Meteor 2 -- Earth weather satellite. Carries equipment to obtain global images of cloud cover and underlying surface in the visible and infrared regions of the spectrum, both in memory-storage and direct transmission mode, as well as radiometric gear for continuous observations of fluxes of penetrating radiation in circumterrestrial space.

Soyuz T-12 -- manned spacecraft. Crew: mission commander twice Hero of the Soviet Union Pilot-Cosmonaut USSR Col V. Dzhanibekov, flight engineer Hero of the Soviet Union Pilot-Cosmonaut USSR S. Savitskaya, and cosmonaut-scientist I. Volk. On 18 July the craft docked with the Salyut 7 - Soyuz T-11 orbital complex, manned by a crew consisting of L. Kizim, V. Solovyev, and O. Atkov. V. Dzhanibekov, S. Savitskaya, and I. Volk returned to Earth on 29 July, after completing the joint activities program. The first EVA by a female cosmonaut in the history of manned missions (25 July 1984) was a notable event.

Progress 23 -- unmanned supply craft. Purpose of launch: delivery of consumables and various other supplies to the orbital station. On 16 August the craft docked unassisted with the Salyut 7 - Soyuz T-11 manned orbital complex. The craft undocked from the complex on 26 August. The craft's mission ended on 28 August.

Kosmos 1593 - Kosmos 1595 satellites, lifted into orbit by a single booster.

Vega 1 -- unmanned interplanetary probe of the Venus-Halley's Comet project. The multipurpose scientific program, developed at the proposal of Soviet scientists, prescribes conduct of investigations of the planet Venus and Halley's Comet. In the first phase of the mission, the Vega 1 probe is to continue study of the Venusian atmosphere, cloud layer and planet surface with the aid of a descent module and perform fundamentally new experiments pertaining to studying circulation of the Venusian atmosphere and its meteorological parameters with the aid of a balloon probe. Subsequently the Vega 1 probe will proceed to rendezvous with Halley's Comet and will perform the first direct combined investigations of this comet from a flyby trajectory. The probe should reach the vicinity of Venus in mid-June 1985 and pass close to Halley's Comet at the beginning of March 1986.

The Kosmos 1614 satellite, after completing its mission, accomplished a controlled reentry and landed in the targeted touchdown area in the Black Sea.

Vega 2 -- an unmanned interplanetary probe. Similar in design and function to the Vega 1 probe. First Vega 2 will deliver a descent vehicle and balloon probe to Venus, after which it will proceed toward Halley's Comet. Launching of two unmanned probes will make it possible to extend the duration of scientific measurements of the characteristics of Halley's Comet and to investigate various regions of the planet Venus. The Vega 2 will reach the vicinity of Venus in mid-June 1985 and will pass close to Halley's Comet in March 1986.

Key to table: 1a. Date of launch; 2a. Name of vehicle; 3a. Initial orbital period, minutes; 4a. Apogee, km; 5a. Perigee, km; 6a. Orbital inclination, degrees; 7a. Orbital altitude; 1b. January; 2b. Kosmos; 1c. February; 2d. Soyuz; 2e. Raduga; 3e. Hours; 4e. Circular; 2f. Progress; 1g. March; 2h. Ekran; 2i. Molniya; 1j. April; 2k. Gorizont; 1l. May; 1m. June; 1n. July; 2o. Meteor; 1p. August; 1q. September; 1r. October; 1s. November; 1t. December; 2u. Vega



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CSO: 9144/565

HISTORY OF ADVANCE OF SOVIET SPACE MEDICINE SKETCHED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 44-45

[Article, published under the heading "Cosmonaut Training," by Candidates of Medical Sciences I. Tarasov and I. Skiba: "Strides by Space Medicine"]

[Text] The term "medical-biological training (preparation) of cosmonauts" came into use during preparation for the first manned space flight. Prior to that time physiologists and aviation medicine people did not employ this term. At the time the term applied to selection of persons whose state of health made them suitable for space flight, as well as possible adjustment of their health in the process of training. It was necessary to determine the possibilities for and conditions of manned orbital flight. For this reason they selected physically fit and healthy pilots and taught them to work with life support systems and specialized high-altitude gear.

In conformity with the experience amassed by aviation medicine as well as advances in the physiology of labor in unusual conditions of habitat environment, steps were undertaken in the direction of determining the safety of a first manned flight into space. These included first and foremost biological investigations on animals carried on board rockets and Earth orbital satellites. But even this research did not exclude the factor of the unknown. Yu. Gagarin's flight finally introduced some clarity into the matter. This mission was a landmark in space medicine. It was proven that man can tolerate weightlessness, maintain fitness during a flight, and return to Earth healthy. This attested to the correctness of the cosmonauts' training.

But how will man behave in conditions of extended weightlessness, for a period of 24 hours, for example? G. Titov flew the second manned space mission. He proved that man can live and work in a spacecraft at the rhythm of terrestrial life routine. At the same time certain negative elements were determined. In particular, factors of space flight negatively affect the functioning of the vestibular mechanism and the entire statokinetic system. Detailed debriefing of German Stepanovich on his flight focused the doctors toward development of new methods both of cosmonaut selection and training drills to prepare the vestibular mechanism. At the same time design changes were made in the Vostok spacecraft systems.

The next important landmark was the flight of the world's first female cosmonaut, V. Tereshkova. Medical-biological cosmonaut training was enriched by knowledge in the area of female physiology and psychology. Here too we encountered a new negative factor, the effect of space flight on the human visual-vestibular system. Optokinetic stimuli in terrestrial conditions are observed when a person focuses his gaze from the window of a moving train on the ties of an adjacent track or the windows of the cars of a train passing in the opposite direction. Practice routines to train the visual-vestibular system in an optokinetic drum were developed as a result of analysis of this phenomenon.

In the course of the Vostok program doctors, working together with other specialists, decided fundamental matters pertaining to human life and activity in conditions of manned space flight and worked out many items pertaining to cosmonaut medical-biological training.

The swift advance of space exploration was presenting medicine with new tasks. The principal task at this stage was the training of a crew consisting of specialists of different areas of specialization. Exploration with multiple-member crews and cosmonaut extravehicular activities began with the missions flown by V. Komarov and P. Belyayev. A doctor went along on one of these missions, taking direct part in medical investigations and observations. Joint efforts by representatives of different areas of specialization made it possible appreciably to expand the volume of knowledge on training cosmonauts. The degree of objectivity in our work also increased.

The next item on the agenda was the problem of life support and activities of a small group in conditions of space. This was a prelude to solving psychological problems pertaining to crews living and working on board future space stations. It was at this time that aircraft began to be used for training crews in conditions of brief weightlessness, particularly during preparation for A. Leonov's space walk. This method was subsequently improved and became standard.

General physical and specialized training became more precisely defined. There arose the need to train the statokinetic system and an important element of this system -- spatial orientation in supportless space. The first programs were devised for various training elements: vestibular mechanism, on the centrifuge, and in altitude chambers. The system of medical observation was established. Medical-biological training became differentiated.

At this stage the medical people began addressing matters pertaining to preventive measures aimed at keeping cosmonauts fit for a long professional career and maintaining a high level of work fitness.

A deepening of investigation of man's potential abilities and devising of methods of comprehensive training of cosmonauts to perform such specific tasks as spacecraft maneuvering and docking constituted the main directional thrust of medical-biological preparations for Soyuz spacecraft missions. In the process of missions lasting many days, cosmonauts performed experiments of economic significance as well as scientific and medical-biological

investigations. The end objective of this program was to prepare man to solve the basic problems with the operation of orbital space stations.

The mission flown by A. Nikolayev and V. Sevastyanov was notable in this regard. The work schedule of their 18-day sojourn in space was crammed with experiments. They investigated the cardiovascular, respiratory, and central nervous systems, and the functions of analysors. Although readaptation involved certain difficulties, we became convinced that man can work effectively in weightlessness for a fairly extended period of time.

Methods of preparing cosmonauts for extended missions and preventive-medicine measures appeared as a result. Fitness training for the blood circulatory system was adopted, for example. Individual crew member training plans and schedules began to be prepared. Instruction to develop skills in operating the onboard medical complex, in rendering self- and mutual medical assistance and conduct of medical observations in flight were adopted in the medical part of the program.

Thus a scientific-methods foundation was laid down in space medicine at the threshold of extended missions on board orbital space stations. Combined simulators were designed and built for physical fitness training, as well as weighted and vacuum suits, and various medical apparatus for forecasting timetables for extended flights. Doctors utilized the potential of TV communications for providing the crew psychological support. They arranged for a crew in orbit to communicate with families, friends, performing artists and scientists. Medical-biological research conducted on board the orbital station was also expanded.

The longest manned mission in the history of space exploration recently came to an end -- 237 days in space by L. Kizim, O. Solovyev, and O. Atkov. This was first and foremost a unique medical experiment, a source of information for studying the influence of space factors on man, for determining man's psychophysiological capabilities, as well as maximum allowable stay in orbit. Weightlessness exerts a specific influence on the human organism. The composition of the blood changes, for example, there occurs partial washing out of calcium from the bones, as well as changes in the muscle system.

All data obtained by the most recent mission are presently being thoroughly studied and analyzed. But one can already state that this data will help improve methods and means of medical-biological preparation of future crews.



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CSO: 9144/565

COMMEMORATIVE PINS, BADGES DEALING WITH SOVIET SPACE PROGRAM

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 44-45

[Article by Lt Col Med Serv V. Goncharuk: "Souvenir Badges"]

[Text] Collecting of souvenir pins, badges and buttons pertaining to space began at the same time as the first artificial Earth satellite. Since that time more than 1,000 different items dealing with space have been produced in this country alone. Of considerable importance for widespread recognition of this subject were both the novelty and opportunity to gather a collection which vividly and multifacetedly reflects the grandeur of an exploit by the Soviet people -- pioneers of the space age.

Sometimes cosmonauts are the authors of souvenir pins and badges. One of the first souvenir pins bearing the inscription "Zvezdnyy Gorodok" [Cosmonaut Training Center] was produced at the Leningrad Mint, based on a sketch by Pilot-Cosmonaut USSR A. Leonov. It was given to personnel at the Cosmonaut Training Center. The design symbolically depicts the Earth and the figures of two cosmonauts soaring in space. An attractive souvenir pin was specially produced for visitors to Zvezdnyy -- a rectangle measuring 16 x 34 mm, of anodized aluminum. In the center there is a cosmonaut figure in relief against the background of a star-studded sky. In his right hand he is holding a satellite, the orbital path of which arcs up from the Earth below.

Gagarin readings have been conducted for more than 10 years now, beginning in April 1971, in Moscow and Zvezdnyy Gorodok. They help publicize the latest advances in Soviet aerospace science and technology as well as scientific research in space. Participants in the readings are given a round souvenir pin 24 mm in diameter, bearing a portrait of Yuriy Gagarin (full face).

On 14 April 1971 the Cosmonaut Training Center imeni Yu. A. Gagarin was awarded the Order of Lenin for distinguished service in training crews for space missions, for participation in exploration of space, and in connection with the 10th anniversary of man's first flight in space. A jubilee medal and a special badge, presented to cosmonauts and Center personnel, commemorated this date. The ribbon bar of the badge, which is of stainless steel, bears the dates 1961-1971 and a laurel branch. Suspended from the ribbon is a regular pentagon on which is through-cut a portrait of Yu. A. Gagarin.

In 1972 souvenir pin collectors added a series of "Zvezdnyy" pins to their collection. The central part of each pin, measuring 21 x 19 mm, bears a miniature photographic portrait of a cosmonaut, under which are inscribed his last name and his first name and patronymic initials. Embossed on the left is a Pilot-Cosmonaut USSR badge, with the inscription "Zvezdnyy" placed below. The first pin in the series bears a portrait of Academician S. P. Korolev, the founder of practical astronautics.

The 20th anniversary of Zvezdnyy was commemorated by a number of new badges. One of them depicts the sculpture entitled "Man in Space," which is to be found at Zvezdnyy Gorodok. On the obverse the following text appears around the edge: "Cosmonaut Training Center imeni Yu. A. Gagarin." The following inscription appears on the reverse: "1960. Zvezdnyy Gorodok. 1980." The figure "XX" appears on the ribbon bar, framed by laurel branches. The badge is of unique design, in the form of a five-pointed star against the background of a rocket being launched. There is a portrait of Yu. A. Gagarin in the center of the star, with the following text around the edge of the badge: "Zvezdnyy Gorodok. XX." This badge was designed by Pilot-Cosmonaut USSR V. Dzhanibekov.

In 1982 the Experimental Creative-Production Combine of the RSFSR Art Foundation put out pins honoring Interkosmos. The center of this round pin, 45 mm in diameter, bears the Interkosmos emblem, while around the edge are arrayed the national flags of the member countries of the Interkosmos program. On another pin a spacecraft appears against the background of a dark-blue sky, with the following inscription around the edge: above -- "International Space Flights," and below -- "Interkosmos."

...Exploration of space is continuing. Zvezdnyy Gorodok will continue seeing Soviet cosmonauts off into space. And souvenir pin and badge collectors will add to their collections new metal miniatures depicting these events.



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CSO: 9144/565

PROPOSED U.S. PERMANENT SPACE STATION ACCUSED OF MILITARY MISSION

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 45-46

[Article, published under the heading "The Pentagon's Orbital Arsenal," by L. Tkachev: "Weapons of Aggression"; based on materials published in the foreign press.

[Text] It does not seem so long ago at all when many people greeted with amazement and delight the launching of the first artificial Earth satellite. It was hard to believe that such a magnificent victory had been achieved over the forces of nature. Man quickly becomes accustomed to technological advances, however. Today we do not even give thought to the extent to which the space program has broadened the capabilities of the traditional branches and sectors of the economy.

At the same time, just as somewhat more than two decades back, people have once again turned their gaze toward space, now without amazement or delight, it is true, but with alarm for the fate of the world. More and more frequently we are faced with a key question of the present day: should weapons be deployed in space?

The fact is that the U.S. military-industrial complex is devoting increasing efforts toward the militarization of its space projects and the building of specific orbital weapons and antisatellite systems. And although for the present they rest in the briefcases and minds of specialists or are in the stages of development and testing, the time is drawing near when death-dealing weapons may be launched into space, especially if one considers the fact that each year the Reagan Administration is spending billions of dollars on their development.

Recently it approved the idea, nurtured by certain circles for many years now, of building a permanent space station. Numerous assurances by government officials about its allegedly peaceful function have been disproved by Defense Department spokesmen, announcing that their department "will give considerable assistance to the program." And as we know, there is not a single item in the Pentagon budget which specifies expenditures for peaceful research. It is therefore easy to guess what assistance the Pentagon's specialists will render. As the Western press reports, they are actively involved in drafting

technical requirements which ensure the possibility of utilizing the station for military purposes.

The station, for the construction of which the administration is allocating 8 billion dollars, is to ensure a permanent U.S. presence in space and to become not only a laboratory but also a transport vehicle, an orbital weapons arsenal, and a platform for brigandage in space and on Earth. It is for good reason that the director of NASA called it the "cornerstone" of the "Star Wars" program being devised by the Pentagon.

Just what do we know about this station? All designs are basically in agreement, describing modular construction with the possibility of gradually adding on to the station. The "nucleus" would be built during the first phase, toward the beginning of the 1990's, to which functional modules will subsequently be added.

Of the probable modes of combat employment of a space station, the foreign press points first and foremost to its possible use as a platform for such weapons as lasers, nuclear devices, missiles, kinetic-energy weapons, a hypervelocity cannon, as well as a command post capable of functioning independently of ground facilities.

According to the Pentagon's requirements, the station design and manning crew should provide for its multipurpose utilization, in order to have the capability to carry out a broad range of combat operations in space and from space. In particular, a space station in combination with a transatmospheric vehicle, which the Pentagon also plans to develop, virtually constitutes a space-based reconnaissance-strike system capable of performing strategic missions. Among the principal advantages of a space station, U.S. Air Force experts note those which are connected with the presence of man on board.

Blowing a smoke screen with demagogic claims about an allegedly growing "Soviet threat in space," U.S. leaders are in fact becoming the instigator of development of space weaponry and are giving the green light to another large-scale program for development of offensive space weaponry.

Today, during the year of the 40th anniversary of Victory over fascism, we should like to recall some lessons of history. From the very first day of existence of the Soviet nation, imperialism endeavored to strangle the young Republic by any and all means. But nothing came of this. In addition, a socialist community was born, which today has achieved a military balance in the world. And now Reagan, with his "defense initiative" in space, is attempting to tip the strategic balance of power in his own favor. History tells us, however, the cost of such undertakings. Hitler's ventures cost the peoples of our planet 50 million human lives, while Reagan's ventures could cost considerably more dearly. And this time the bosses of the U.S. military-industrial complex will not be able to avoid settlement of accounts either.

"People, be vigilant!" this appeal by Julius Fucik, outstanding son of Czechoslovakia, sounding out from fascist torture chambers 40 years ago, is extremely relevant today as well.



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CSO: 9144/565

STEALTH TECHNOLOGY REVIEWED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 6, Jun 85 (signed to press 6 May 85) pp 46-47

[Article, published under the heading "Weapons of Aggression and Brigandage," by Engr A. Mikhaylov: "'Invisible' Aircraft: Plans and Reality"; based on materials published in the foreign press]

[Text] In its plans for a large-scale arms race, the present U.S. Administration assigns an important role to development of the new ATB bomber, which is to become a part (alongside land-based ballistic missiles and submarine-launched missiles) of the strategic forces triad. It is proposed to build this bomber utilizing "Stealth" technology, which would reduce the probability of its detection by radar and infrared sensors.

Enormous sums of money are being pumped into the ATB bomber project. Seven billion dollars is being appropriated just for the experimental design phase, while the cost of building 100 aircraft may reach as much as 30 billion dollars. It is proposed to employ Stealth technology on bombers, tactical aircraft, and cruise missiles.

Development of the ATB is closely linked with plans to build the B-1 bomber (the U.S. Administration's initial decision against going into production on the Rockwell B-1 strategic bomber does not indicate a reduction of arms. As is reported in the foreign press, it was necessary to reexamine the concept of the strategic bomber, since the effectiveness of the B-1 in penetrating hostile air defense had proven insufficient and the demand that it be provided with greater supersonic speed had been acknowledged to be in error.

President Reagan, adopting a policy aimed at achieving military superiority over the USSR, in October 1981 made the decision to develop the improved B-1B bomber, production of which is to begin this year. According to plans, 100 of these aircraft are to be built by 1988. According to the estimates of U.S. military experts, however, the B-1B bomber will be unable successfully to penetrate the enemy's air defense by the end of the 1990's, and therefore an additional decision was made, to develop the ATB bomber, in the Stealth Program. Regular production of the ATB is scheduled to begin in 1988-1989. The B-1B bomber will be used as a cruise missile launch platform or as a

conventional bomber and will replace the B-52 bombers which are currently in service.

The previous U.S. secretary of defense stated in a speech on 22 August 1980 that the Stealth technology "is a major technological improvement, which is of considerable military significance." Stating that work on the Stealth program is in line with the U.S. arms control policy and will constitute "an exceptionally important instrument of peace," he noted that Stealth technology will make it possible to design "piloted and pilotless aircraft which existing air defense systems would be unable to detect and destroy." U.S. ruling circles do not conceal the fact that development of the new bombers is also an instrument of pressure on the USSR. According to the U.S. aviation publication AEROSPACE DAILY, for example, B-1B and ATB bombers with Stealth technology are viewed as mutually augmenting weapons systems, defense against which is extremely difficult and will require enormous expenditures.

Does this new weapon have promise and to what extent are plans to develop an "invisible" aircraft feasible? The problem of reducing the conspicuousness of military aircraft has drawn the attention of designers throughout the entire history of aviation. It remained unsolved, however, with the development of radar, infrared, TV and other imaging technologies. In addition, the development of missile weapons with different types of homing heads or seekers increased the probability of detecting and destroying aircraft. And means of electronic warfare do not enable one fully to resolve the problem of making an aircraft undetected in flight. Foreign military experts believe that concealment can be improved by reducing an aircraft's radar cross section (EPR) (reducing its size, employing low-reflectivity shapes and materials which absorb electromagnetic waves) and by reducing the intensity of infrared emissions. The term Stealth technology includes all the above-listed methods of reducing an aircraft's signature. Thus it is a synthesis of many technical solutions. At the same time it is difficult to increase the degree of concealment of aircraft due to the wide band of frequencies at which electronic detection and guidance devices operate.

Reflection can be reduced by employing configurations lacking so-called "bright points." These include points of juncture and abrupt transitions which act like corner reflectors, sharp edges, and large areas of surface with little curvature. Radar cross section can also be reduced by using radioabsorbing nonmetallic materials in which radio wave absorption, scattering and interference occur. But their main drawback is narrowness of effective waveband and considerable weight.

As was reported by the journal NEW SCIENTIST, attempts to decrease an aircraft's radar signature were undertaken in the United States during development of the Lockeed SR-71 Blackbird strategic reconnaissance aircraft. This aircraft features a smooth transition of wing to fuselage and wing to engine nacelle, a smooth lower surface (no antennas or projections), and a tail design with two inward-canted vertical tails. Its blue-black paint covering allegedly absorbs radio waves. They failed, however, greatly to reduce the aircraft's radar signature.

First reports about the conduct of research in the United States on Stealth technology were published in 1975, and the project was classified in the spring of 1977, as a result of which reports on the program began to be distinguished by brevity and the contradictory nature of the information they contained. Several U.S. companies took part in development of the new aircraft.

Flight tests of the Lockheed-built XST single-seat aircraft, with a takeoff weight of approximately 5,450 kg, began at a test range near Nellis Air Force Base, Nevada. This aircraft crashed in May of the following year. By April 1982 the company had built and flight-tested several experimental aircraft incorporating Stealth technology. The foreign press reports that in the initial phases of the Stealth program tests were also conducted on ramjet-powered supersonic pilotless winged vehicles, modified versions of the previously-developed GTD-21. In some publications it is noted that at first it was planned to employ Stealth technology on fighters and aircraft tasked with the mission of sealing off a battlefield. According to other information, the aircraft was to be a Pave Mover radar platform, to be used for antitank missile guidance. In the summer of 1980, however, the U.S. secretary of defense officially announced that work on the Stealth program had been focused primarily on the development of a strategic bomber.

According to the plan, the ATB bomber is to fly at subsonic speed and be of a "flying wing" design. The engines are to be mounted in the central part of the wing, with shielded nozzles. The airframe has smooth lines. The skin and some load-carrying members will be made of carbon-reinforced plastic. The radar cross section of the ATB aircraft is considerably smaller than that of the B-1B bomber (1-3 sq m) and its original version, the B-1 (approximately 10 sq m). An electronic weapons control and guidance system is being developed for the ATB bomber, as well as electronic countermeasures gear. The magazine FLIGHT INTERNATIONAL reports that an experimental aircraft tested at the beginning of 1981 had its air intake positioned atop the fuselage aft of the cockpit, with a flattened, variable-area nozzle between vertical tails above the rear part of the wing. It is possible that these configurations will also be employed on the ATB bomber. It is believed that intensive turbulence of flow at the engine inlet will ensure normal operation of engines with top-positioned air intakes, while a flattened nozzle between tail fins will reduce intensity of infrared radiation.

Features on the B-1B bomber include shielding of the engine fan with a curved-path air intake, windshield with a metallized coating, a radar fairing of radio transmissive material for a narrow band of frequencies, and a radio-wave absorbing coating. Some of these features will also probably be employed on the ATB. This aircraft's armament should be contained internally. Conformally-mounted antennas are being studied. A flat cockpit windshield may be incorporated in order to reduce reflection.

The U.S. Air Force is planning to develop new radio-wave absorbing materials and airfoil leading edge structural designs which would be strong, resistant to the effect of rain and lightning strikes, and cheap to manufacture. In the summer of 1982 Japan's Ministry of International Trade and Industry submitted to the Pentagon samples of a ferrite paint developed by a Japanese company.

Experts believe, however, that this paint "will excessively weigh down the aircraft" due to a large coating thickness (1 mm).

U.S. experts believe that the ATB bomber with Stealth technology would be able to penetrate a hostile air defense system at medium and high altitudes. According to a report in NEWSWEEK magazine, however, low altitudes have been recognized as more feasible for this purpose. At the beginning of 1982 it was noted that development of a radar illumination warning system for an aircraft flying at high altitudes presents considerable difficulty as a consequence of the fact that such an aircraft may be in the zone of effect of a large number of ground sources of emission.

Foreign experts believe that an aircraft with Stealth technology can be detected by distant early warning radar, but a narrow, high-frequency radar beam will be unable to guide a surface-to-air missile to the target. In other words, the aircraft can be "seen" but not easily destroyed.

According to U.S. Air Force plans, Stealth technology will also be employed in the development of tactical aircraft and cruise missiles. The magazine AVIATION WEEK AND SPACE TECHNOLOGY reports that Lockheed is to build 20 CSIRS "low-vulnerability all-weather reconnaissance and strike" aircraft, tasked with flying special missions. They will be based in the U.S. desert Southwest, from where they will be delivered to various regions by military transport aircraft. The CSIRS aircraft is similar in size to the F-18 Hornet fighter. It features a lifting-body fuselage, triangular in planform with smooth contours, a single engine with a flattened nozzle, and inward-canted vertical tails. The engine air intake is positioned on top of the fuselage aft of the cockpit. In some magazines it is called a fighter, while the Swiss newsletter INTERAVIA AIR LETTER even gives a possible designation -- F-25. The magazine BUSINESS WEEK maintains that it is probably a subsonic reconnaissance aircraft.

In conformity with the plan to build strategic cruise missiles with nuclear warheads, the U.S. Air Force intends to purchase approximately 1,500 such missiles with Stealth technology. They will be combat-ready in 1986.

Work on the U.S. Stealth technology program is being conducted on a broad front. In the estimate of foreign experts, however, success is far less probable than is being advertised. U.S. Air Force Deputy Chief of Staff K. Burke stated in March 1982 that the technological risk connected with development of the ATB bomber is many times greater than that involved in developing the B-1B. Nevertheless U.S. Government circles are spending enormous funds on modernizing strategic bombers, developing new types of strategic arms, and beefing up the U.S. military potential. Endeavoring to achieve military superiority over the USSR, the Reagan Administration and the bosses of the military-industrial complex, contrary to common sense and the

peace-seeking aspirations of peoples, are whipping up a militarist psychosis, escalating the arms race, and holding the world under a threat of nuclear catastrophe.



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CSO: 9144/565

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